HOUSTON PUBLIC WORKS

FLOODPLAIN MANAGEMENT DATA ANALYSIS CHAPTER 19

MARCH 2018

CONTENTS

CHAPTER 19 DATA ANALYSIS

CHAPTER 19

I. GLOSSARY

Impacted: suffered damage from wind, rain or floodwaters during Hurricane Harvey.

Flooded: suffered damage from rainwater or floodwaters during Hurricane Harvey.

Homes: Single-family residences.

Structures: All residential and commercial properties.

Substantial Damage: The damage of any origin (such as a flood event) is of sufficient magnitude that the cost of restoring the structure to its pre-damage condition equals or exceeds 50% of the market value of the structure. The market value of the structure does not include land value. Substantial damage is determined either based on the City of Houston or FEMA-performed Substantial Damage Estimate, based on homeowners' request or on information submitted with a permit application.

Substantial improvement: Any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50 percent of the market value of the structure before the "start of construction" of the improvement. This term includes structures which have incurred "substantial damage," regardless of the actual repair work performed.

II. EXECUTIVE SUMMARY

> **"We can't stop Mother Nature, but we certainly can take definitive steps to mitigate against the risk of flooding." – Mayor Sylvester Turner**

After the devastating flood damage caused by Hurricane Harvey, the City of Houston has resolved to leverage every opportunity to make the City more resilient to future flooding disasters. The City's floodplain regulations are an important tool for reducing the flooding risk to lives and property in new development and redevelopment projects.

With the goal of informing a review of those regulations, Houston Public Works (HPW) has prepared this report, based on extensive analysis of data collected both before and after the storm. Work on the report began in September 2017. Preliminary conclusions were drawn in December. New data – which reinforced and validated the preliminary conclusions – continued to be collected and analyzed through early March of 2018.

The report looks at the impacts of Harvey on structures in the 100-year and 500-year floodplains, and it evaluates the potential flood risk reduction (including potential costs) of a range of more stringent Chapter 19 floodplain regulations.

The focus of this report is on single-family residences. However, the City's goal is to reduce the risk of flooding for all new and redeveloped structures.

The data clearly shows that current floodplain regulations – which require only structures in the 100-year floodplain be elevated one foot above the 100-year flood elevation – were inadequate to protect homes from flooding in Harvey. While 33 percent of *all* homes in the 500-year floodplain flooded during Harvey, an even higher percentage (38 percent) of all the *currently compliant* homes in the 100-year floodplain flooded.

What's more, while Harvey represented a record-breaking weather event, preliminary results of NOAA climate studies indicate that the frequency and intensity of rainfall events are likely to increase in the future, resulting in a 100-year floodplain likely to be much closer to today's 500-year floodplain. The analysis in this report seeks to avoid the mistake of assuming that past experience defines the extent of future risk.

While a range of potential new Chapter 19 regulations was studied, a change requiring new structures in the 100- and 500-year floodplains to be elevated 2 feet above the 500-year flood elevation emerged as the optimum recommendation, based on predicted benefits as well as potential costs.

Analysis shows that if all of Houston's homes had been compliant with these requirements, 84 percent of the homes that flooded during Harvey would have been spared.

Data drawn from (among other sources) the Greater Houston Builders Association (GHBA), the Houston Housing and Community Development Department, the National Flood Insurance Program and FEMA estimate that the cost to newly constructed homes of complying with these requirements would range from $11,000 to $32,000, while savings from avoided flooding costs could range from $50,000 to many hundreds of thousands of dollars. The benefits from avoided risk to first responders, emotional trauma, health impacts, economic impacts and many other consequences of flooding were not quantified in this study but assumed to be significant.

While the comprehensive flood mitigation strategies of the City of Houston are beyond the scope of this study, it is clear that new and more stringent Chapter 19 regulations would need to be part of a larger framework of flood mitigation policies, regulations, and infrastructure investments. Houston Public Works is coordinating with other groups within the City and local and regional stakeholders on a variety of flood risk reduction efforts.

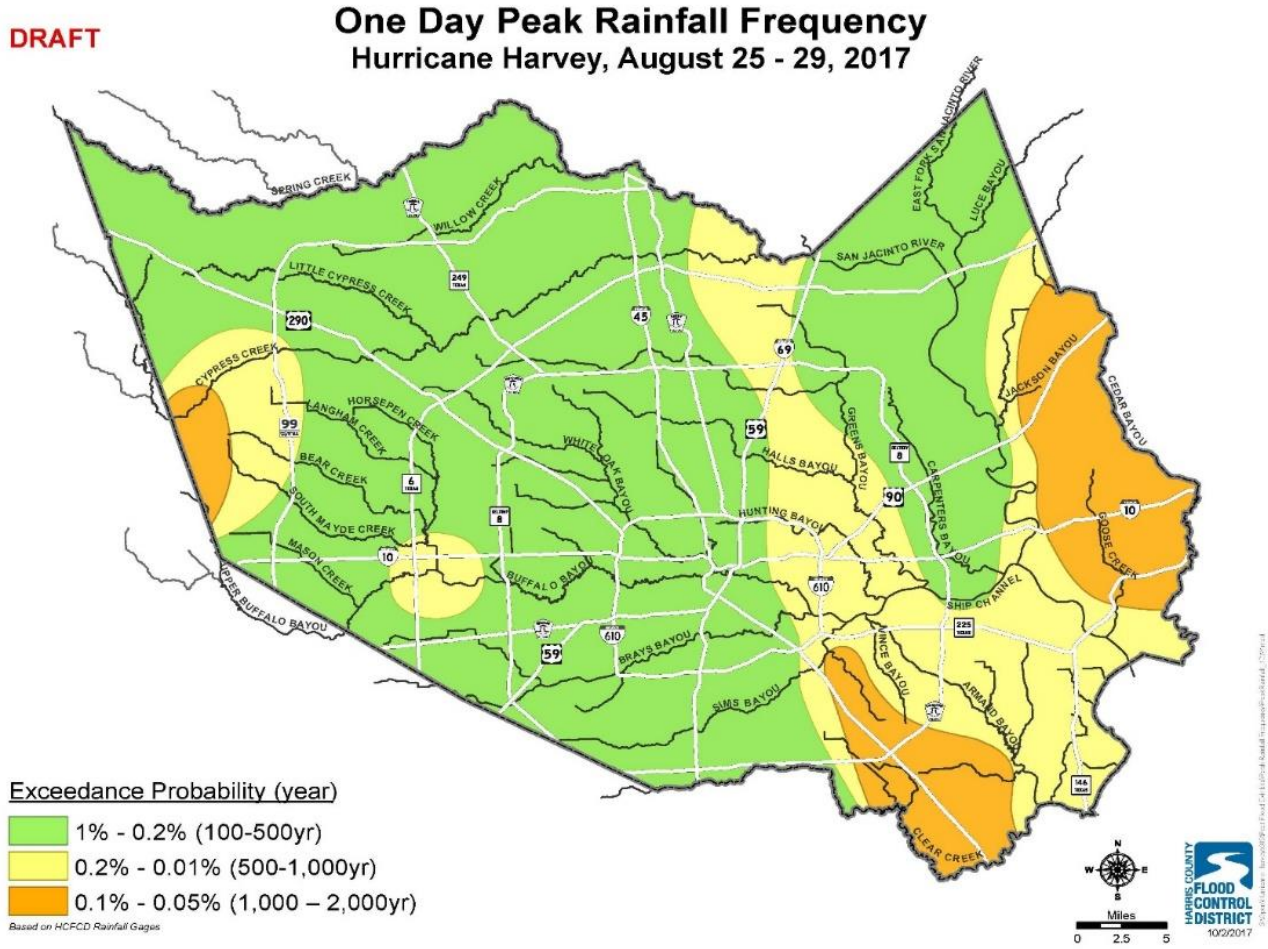
III. HARVEY IMPACTS

Hurricane Harvey resulted in record rainfall amounts across the Houston area. Table 1 compares rainfall from Harvey and other events in Houston. Record flood events are shown in red.

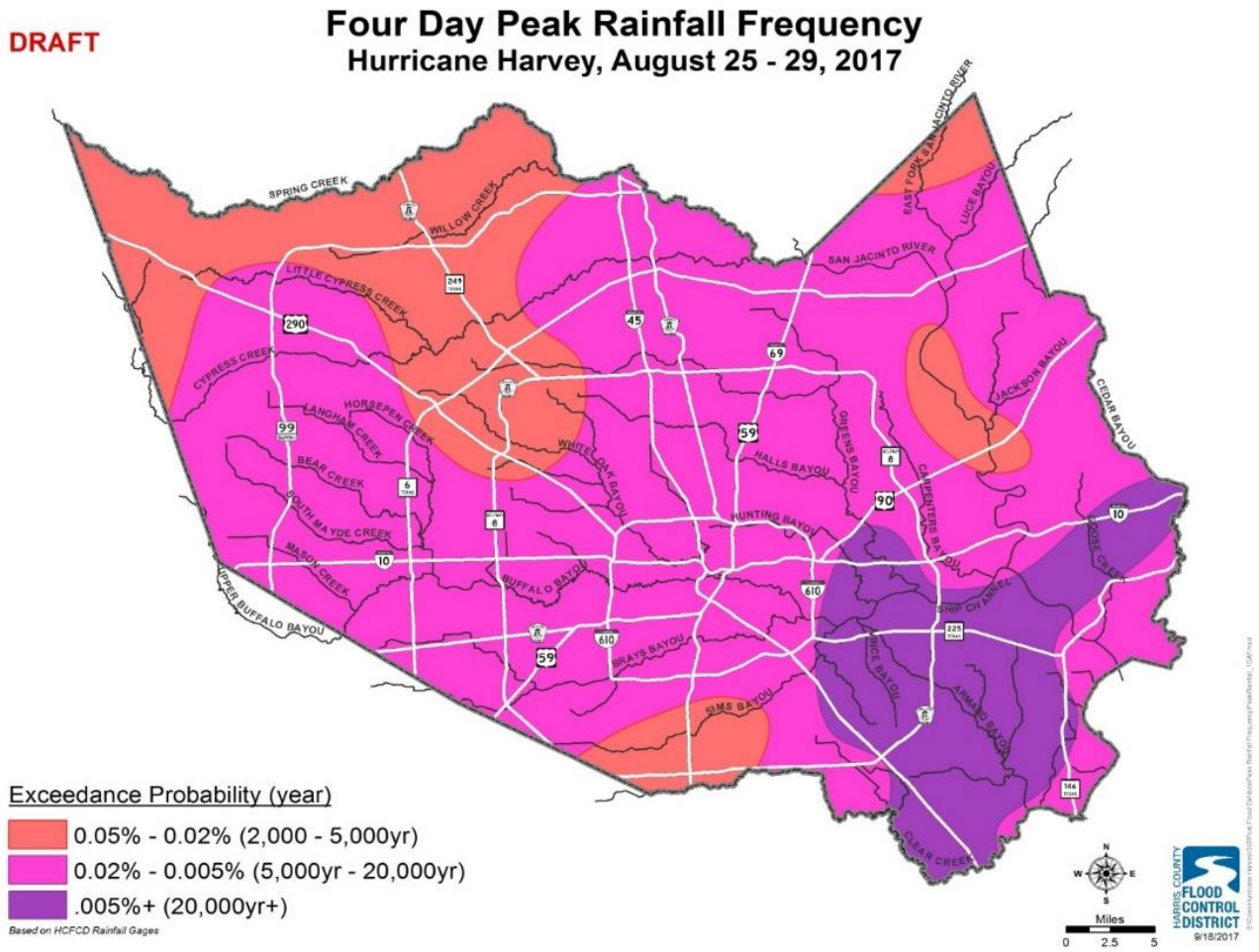
Duration	Harvey August 2017	Allison June 2001	Tax Day April 2016	October 1994
1-hr	**6.8**	5.7	4.7	3.7
2-hr	**11.9**	9.9	7.3	4.7
3-hr	**14.8**	13.5	8.3	5.3
6-hr	18.9	**21.2**	13.9	7.2
12-hr	20.9	**28.3**	16.7	12.0
24-hr	25.6	**28.4**	17.4	20.9
2 days	**35.2**	**28.5**	17.5	23.1
4 days	**47.7**	38.5	N/A	28.9

Table 1 – Harvey Rainfall compared to other record events (Lindner, 2017)

One Day and Four Day peak rainfall intensities far exceeded the 100-year event. Maps 1 and 2 below illustrate the peak rainfall intensities for Harvey.

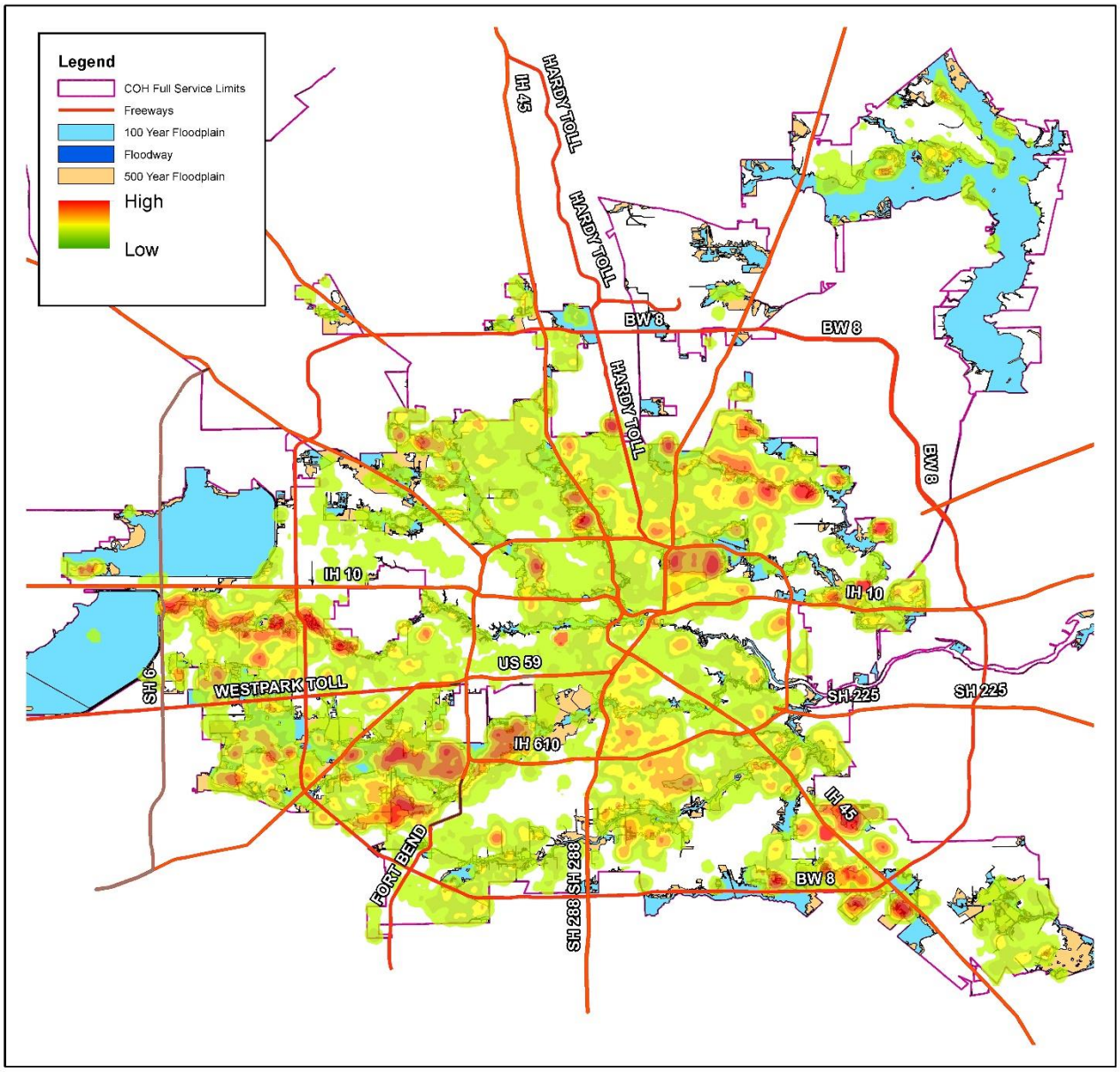


Map 1 – Harvey One Day Peak Rainfall Frequency (Lindner, 2017)



Map 2 – Harvey Four Day Peak Rainfall Frequency (Lindner, 2017)

Harvey's record rainfall left devastating impacts throughout Houston. Map 3 shows, Harvey caused widespread damage within the 100-year floodplain, 500-year floodplain, and outside of the floodplains.



Map 3 – COH Structural Flooding – Hurricane Harvey August 25-29, 2017 (Houston Public Works, 2017) (City of Houston, 2017)

As Table 2 details, a larger number of structures, including single-family homes, multi-family, and commercial buildings, flooded outside of the 100-year and 500-year floodplains than within the floodplains. However, 31% of structures in the 100-year and 500-year floodplains were impacted by Harvey flooding as compared to 19% in the areas of the City outside of either floodplain. Therefore, the concentration of flooding in the 100-year floodplain and 500-year floodplain is much higher than outside the floodplain.

Within the 100-year floodplain, the Floodplain Management Office Preliminary Damage Assessment Data was used. Outside of the 100-year floodplain, the City's Hurricane Harvey Housing Damage data (refer to Appendix A for more information on this data set) was used.

Location	Harvey Impacted	No Damage	Percentage Harvey Impacted	Total
100-year	30,501	70,927	30%	101,428
500-year	28,459	57,611	33%	86,070
100-year + 500-year	58,960	128,538	31%	187,498
Outside floodplains	90,616	379,018	19%	469,634
City Wide	149,576	520,887	22%	670,463

Table 2 – Harvey Flood Impacted Structures by Flood Zone (Houston Public Works, 2017) (City of Houston, 2017) (FEMA Current Effective FIRM, 2018)

Table 2 also shows that a higher percentage of properties in the 500-year floodplain (33%) flooded than in the 100-year floodplain (30%). The same relationship exists when Harvey-flooded properties in the Buffalo Bayou and the San Jacinto River watersheds are excluded to remove the impact of the reservoir releases in Harvey, as shown in Table 3. This indicates the need to expand Chapter 19 regulations to the 500-year floodplain.

Location	Harvey Impacted	No Damage	Percentage Harvey Impacted	Total
100-year	24,068	65,461	27%	89,529
500-year	22,013	53,042	29%	75,055
100-year + 500-year	46,081	118,503	28%	164,584
Outside floodplains	65,131	261,810	20%	326,941
City Wide	111,212	393,644	22%	504,856

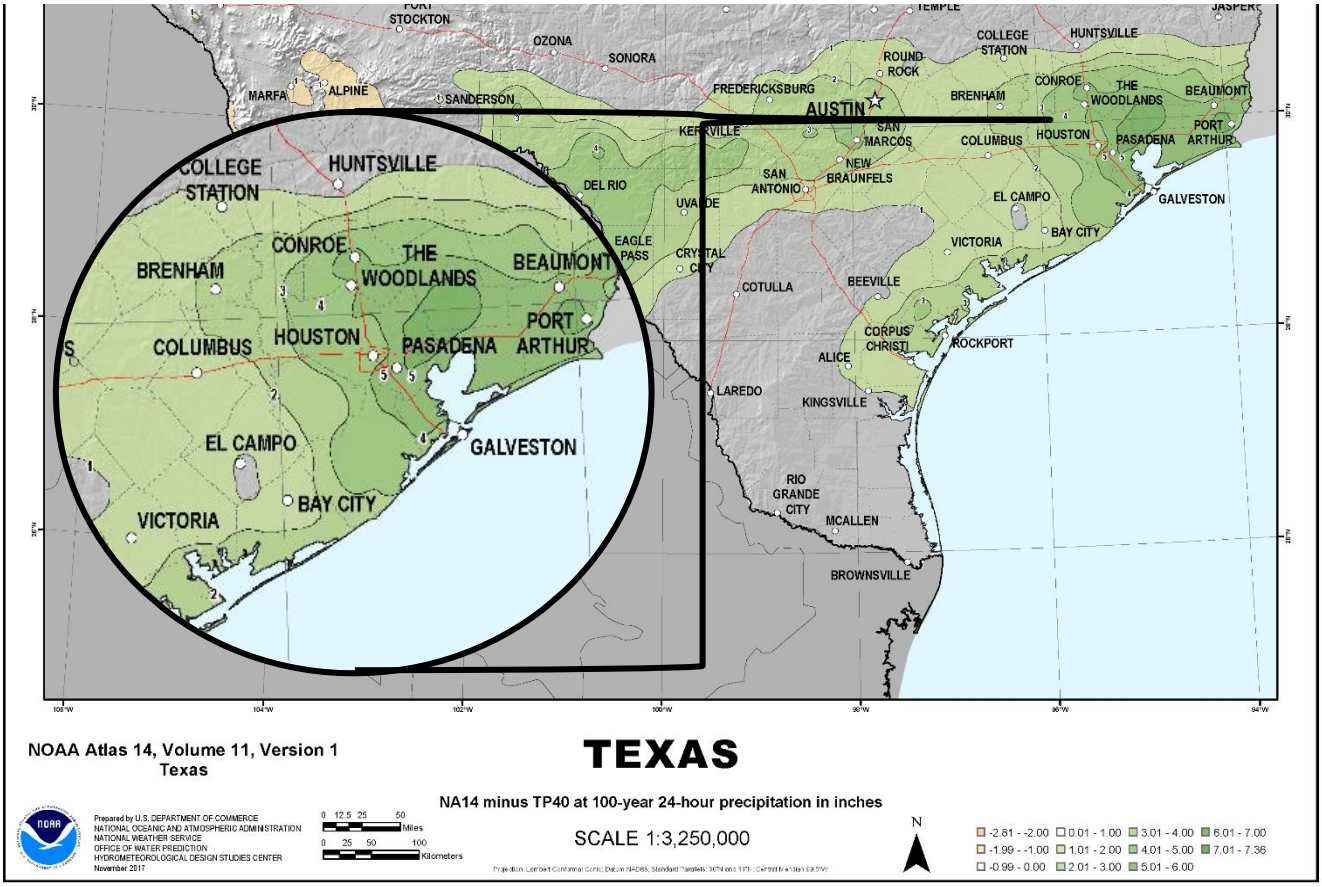
Table 3 – Harvey Flood Impacted Structures by Flood Zone excluding Buffalo Bayou and San Jacinto Watersheds (Houston Public Works, 2017) (City of Houston, 2017) (FEMA Current Effective FIRM, 2018)

In addition to the damage observed in Harvey, Houston has experienced two other major floods in the past three years: 2015 Memorial Day and 2016 Tax Day.

Houston is not the only community experiencing more frequent extreme weather events. It is anticipated that the pending federal climate study will result in floodplain map changes that will significantly increase the 100-year flood elevation and floodplain.

> **"The National Oceanic and Atmospheric Association has studied decades worth of data to reassess the likelihood of a "100-year storm" – or a storm that has a 1 percent chance of occurring in any given year. Preliminary analysis shows that the 100-year storm has risen by three to five inches in Harris County since the last study was conducted in 2001". (Zaveri, 2017)**

As Map 4 from the preliminary findings of Atlas 14, NOAA's climate study shows, the 100-year 24-hour precipitation in inches will likely increase 3 to 5 inches in Houston. The current 100-year 24-hour precipitation is 13-14 inches. The current 500-year 24-hour precipitation is 17-19 inches.



Map 4 – NOAA Atlas 14: Precipitation-Frequency Atlas of the United States-Texas-Preliminary Estimates for Review Only (National Oceanic and Atmospheric Administration, 2017)

The current floodplain ordinance does not regulate most structures in the 500-year floodplain (only critical facilities, such as fire stations, hospitals, schools, public utility facilities and hazardous material storage and distribution facilities). Considering that 33% of structures in this zone were impacted by flooding in Harvey, and that future floodplain maps will reflect the increased risk of flooding due to climate conditions, Houston Public Works recommends the regulation of this area.

IV. SUMMARY OF PROPOSED CHANGES TO CHAPTER 19

The existing Chapter 19 only regulates the 100-year floodplain. Existing requirements include elevating structures to 1 foot above the 100-year flood elevation and zero net fill. The proposed changes include increasing the minimum flood protection elevation to two feet above the 500-year flood elevation in both the 100-year and 500-year floodplains and extending the zero net fill requirement to the 500-year floodplain.

Table 4 compares the existing and proposed provisions of Chapter 19 at the time of this report.

RULES	EXISTING	PROPOSED
REGULATED AREA	100-year	100 + 500-year
ELEVATION	100-year + 1 foot	500-year + 2 feet
ZERO NET FILL	100-year	100 + 500-year
SUBSTANTIAL IMPROVEMENTS	100-year	100-year
ELEVATION OF ADDITIONS	100-year + 1 foot	500-year + 2 feet (exemption for small additions in 500-year)
FOUNDATION	All types permitted outside floodway	All types permitted outside floodway

Table 4 – Comparison of Existing and Proposed Chapter 19 Provisions

The proposed regulations recognize the need to reduce the risk of flooding of structures in the vulnerable 100-year and 500-year floodplains and to ensure that the risk of flooding is reduced for new structures, and that flooding is not worsened for existing structures.

Figure 1 illustrates the proposed change to elevation requirements.

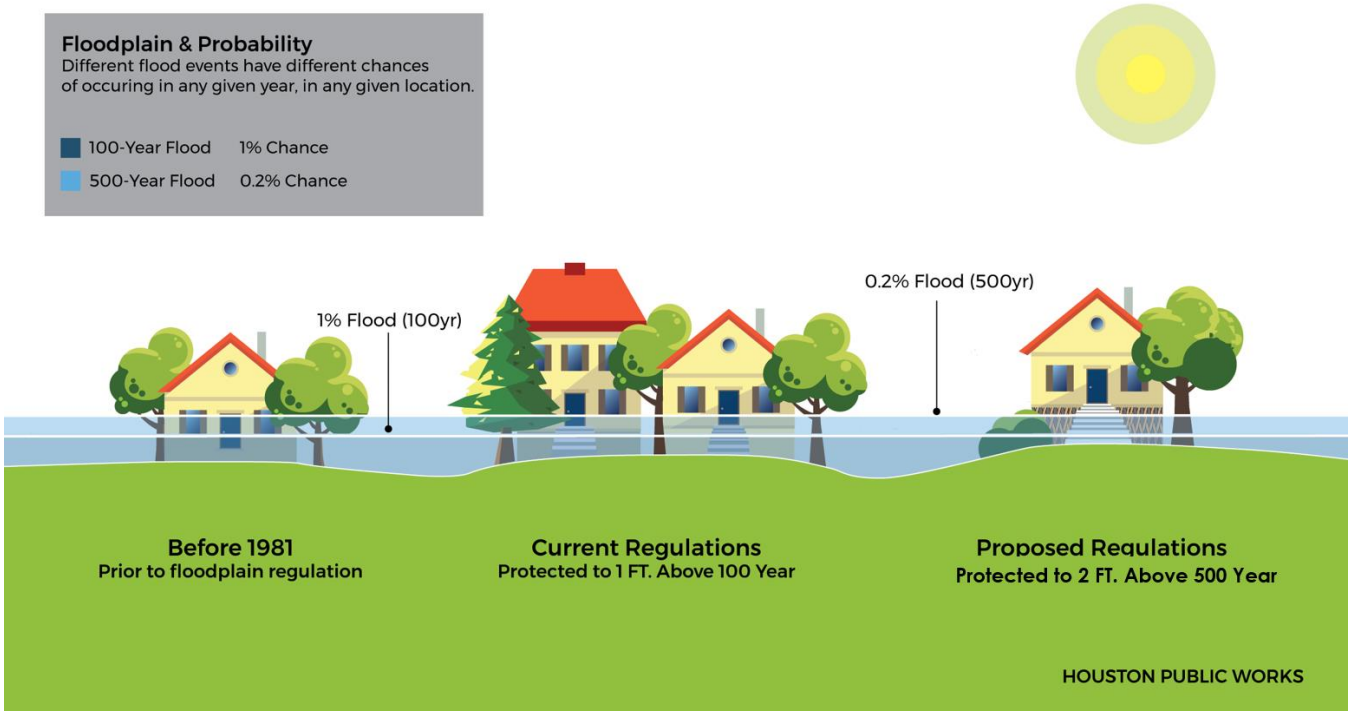


Figure 1 – Floodplain Elevation Requirements and Flood Zones

Elevating a home in a flood-prone area reduces the risk of flooding for that property. On the other hand, adding fill (dirt and construction materials) to the floodplain can interrupt drainage patterns and take up space that was previously available for storing floodwater. If fill is added in the floodplain, the space available for floodwater storage is reduced, the flooding level gets higher, and flooding spreads to other areas.

To prevent fill from making flooding worse and expanding the floodplain, the proposed changes expand the zero net fill provision that requires that any fill brought into the floodplain below the flood elevation be offset by removing the same volume of material from the floodplains. Figure 2 illustrates how the "zero net fill" requirement prevents flooding from getting worse and expanding the floodplain.

<Exhibit to be Inserted Here>

Figure 2 – Zero Net Fill Example

V. REDUCTION OF FLOOD RISK

The current elevation requirements of Chapter 19 were inadequate to protect all compliant homes from flooding in Harvey. Compliant homes are homes in the 100-year floodplain with the lowest habitable floor elevated at least one foot above the 100-year flood elevation. There are over 13,000 compliant single-family residences in the City's 100-year floodplain. Of these compliant homes, 12,472 homes had available data and were studied in this report.

As Table 5 details, of the 12,472 compliant homes studied, a total of 4,788 (or 38%) flooded in Harvey.

100-year floodplain	Flooded Compliant Homes	Total Compliant Homes	% of Flooded Compliant Homes
In Buffalo Bayou Watershed	962	1,364	71%
In San Jacinto Watershed	732	1,245	59%
In Remaining Floodplains	3,094	9,863	31%
100-year Floodplain Total	4,788	12,472	38%

Table 5 – Harvey Flooded Compliant Homes by Watershed (Houston Public Works, 2017) (City of Houston, 2017) (FEMA Current Effective FIRM, 2018) (Harris County Flood Control District, 2009) (FEMA Individual Assistance, 2018)

Increased elevation reduces the risk of flooding. The protection that could have been provided by each additional minimum flood protection elevation against the flooding in Harvey are shown below in Table 6. This analysis compares flooding level in single-family residences to various elevation requirements.

Of the homes that flooded in Harvey, 84% would have been protected from flooding if they were elevated to the 500-year flood elevation plus two feet – the proposed requirement.

Elevation	100-year + 1 foot	500-year	500-year + 1 foot	500-year + 2 feet	500-year + 3 feet
Harvey-flooded homes in 100-year and 500-year floodplains studied	31,822	31,822	31,822	31,822	31,822
Count of homes that would have been prevented from flooding by proposed elevation	15,167	17,942	23,015	26,829	29,505
% of Harvey-flooded homes prevented from flooding by proposed elevation	48%	56%	72%	84%	93%

Table 6 – Elevation required to protect Harvey Flooded Homes studied (Houston Public Works, 2017) (City of Houston, 2017) (FEMA Current Effective FIRM, 2018) (Harris County Flood Control District, 2009) (FEMA Individual Assistance, 2018)

To remove the impact of the reservoirs, the same analysis is provided in Table 7 excluding the Buffalo Bayou and San Jacinto River watersheds.

Elevation	100-year + 1 foot	500-year	500-year + 1 foot	500-year + 2 feet	500-year + 3 feet
Harvey-flooded homes in 100-year and 500-year floodplains studied	26,358	26,358	26,358	26,358	26,358
Count of homes that would have been prevented from flooding by proposed elevation	14,748	16,873	21,283	23,753	25,262
% of Harvey-flooded homes prevented from flooding by proposed elevation	56%	64%	81%	90%	96%

Table 7 – Elevation required to protect Harvey Flooded homes studied excluding Buffalo Bayou and San Jacinto River Watersheds (Houston Public Works, 2017) (City of Houston, 2017) (FEMA Current Effective FIRM, 2018) (Harris County Flood Control District, 2009) (FEMA Individual Assistance, 2018)

As Table 8 details, 2,923 of the 4,788 compliant homes that flooded would have been protected from flooding in Harvey if they were elevated to 2 feet above the 500-year flood elevation instead of 1 foot above the 100-year flood elevation.

	500-year	500-year + 1 foot	500-year + 2 feet	500-year + 3 feet
In Buffalo Bayou Watershed	96	220	412	618
In San Jacinto Watershed	85	132	259	469
In Remaining Watersheds	407	1,497	2,252	2,699
Total flooded compliant homes that would have been protected from Harvey flooding if built to specified elevation	588	1,849	2,923	3,786

Table 8 – Elevation required to protect flooded compliant homes by watershed (Houston Public Works, 2017) (City of Houston, 2017) (FEMA Current Effective FIRM, 2018) (Harris County Flood Control District, 2009) (FEMA Individual Assistance, 2018)

As Chart 1 shows, significant protection from Harvey flooding would have been provided if all the homes in the 100-year and 500-year floodplains were elevated to at least 2 feet above the 500-year flood elevation.

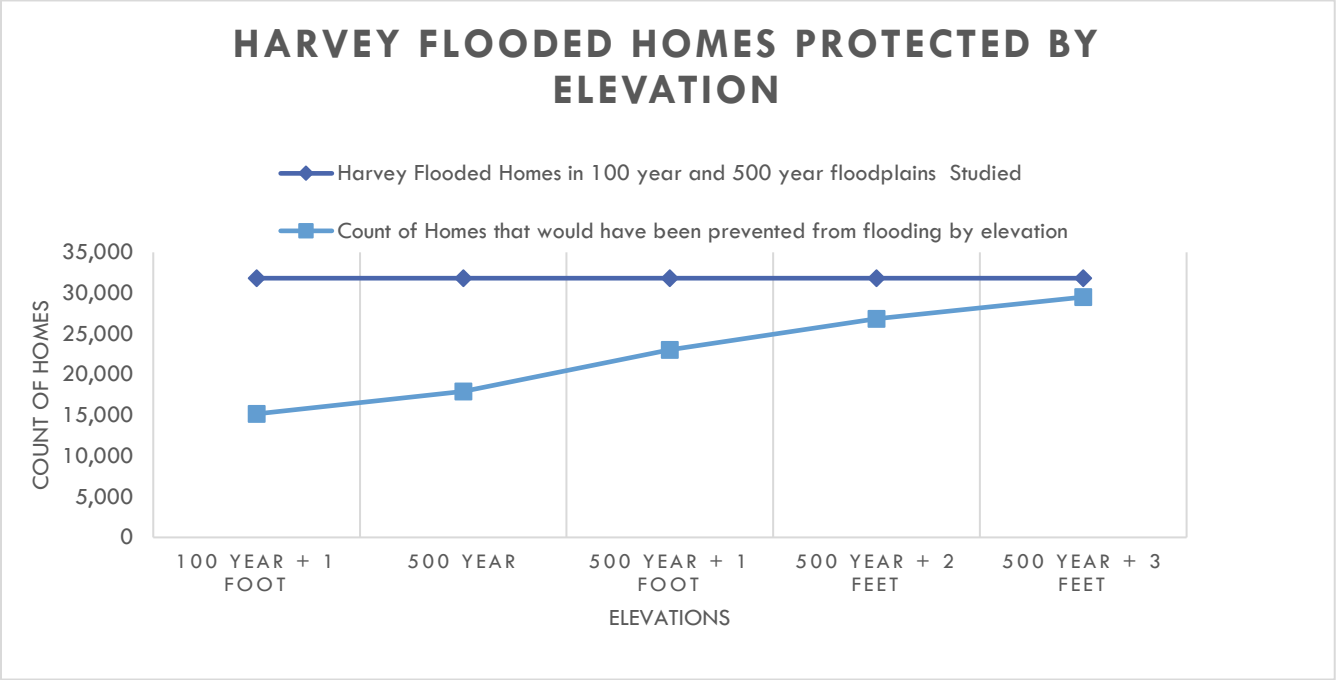


Chart 1 – Harvey flooded Homes Protected by Elevation (Houston Public Works, 2017) (City of Houston, 2017) (Harris County Flood Control District, 2009) (FEMA Current Effective FIRM, 2018) (FEMA Individual Assistance, 2018)

Chart 1 demonstrates that as the specified elevation increases, the number of potentially protected homes increases. As the specified elevation gets higher than the 500-year flood elevation +2 feet, the benefit of additional elevation requirements declines.

VI. POTENTIAL IMPACT OF PROPOSED CHANGES

The City intends for the changes to Chapter 19 to be forward-looking and to inform recovery efforts. The proposed effective date of the changes to Chapter 19 is September 1, 2018.

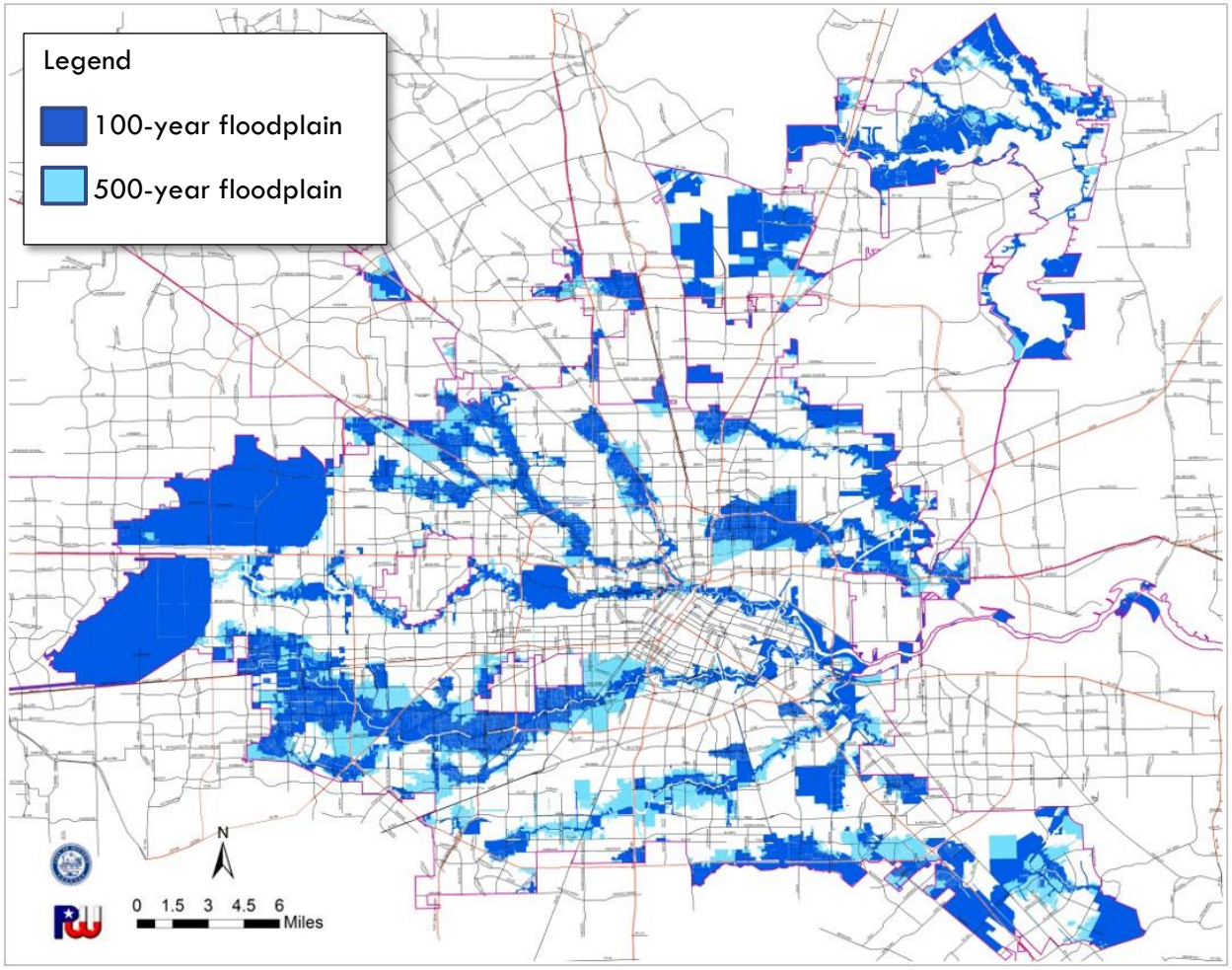
Impacted Area

The proposed changes will reduce the risk of flooding for new developments and redevelopments in the 100-year and 500-year floodplains. The proposed changes will not affect existing homes except under the following conditions:

- A home in the 100-year floodplain receives a "substantially damaged" designation from a future flood event
- A home in the 100-year floodplain is substantially improved

It is important to note that availability of FEMA's National Flood Insurance Program coverage in the City depends on the City's enforcement of certain standards governing home additions in the 100-year floodplain. The City's Community Rating System (CRS) rating (which governs NFIP premium discounts for the community) can be affected as well. In general, additions in the 100-year floodplain need to be raised at least to the 100-year flood elevation. More stringent requirements can improve the CRS rating.

Map 5 shows the area impacted by the proposed changes to Chapter 19, the 100-year and 500-year floodplains. See Appendix B for details on Area and Parcels in the floodplains.



Map 5 – Area Impacted by Proposed Changes to Chapter 19 (FEMA Current Effective FIRM, 2018)

Undeveloped Land

Much of the floodplain is already developed. As Table 9 details, of the 186,985 parcels in the 100-year and 500-year floodplain, just 22,101 (or 12%) have no building footprint. The remaining parcels are already developed.

	100-year Floodplain	500-year Floodplain	Total
Total Parcels	101,246	85,739	186,985
Building Footprint	87,273	77,611	161,884
No Building Footprint	13,973	8,128	22,101
% No Building Footprint	14%	10%	12%

Table 9 – Impacted Undeveloped Land (FEMA Current Effective FIRM, 2018) (Harris County Appraisal District Building Footprints, 2016)

New Home Permits

In the last ten years, 8,467 new home permits in the 100-year and 500-year floodplains have been issued (compared to 29,511 new home permits outside of the 500-year floodplain). As Table 10 summarizes, the average total HCAD Valuation (improvement and land) of the permitted new homes is $388,144. The estimated average cost based on the unit construction cost from the International Code Council Building Valuation Table is $329,363.

	New Homes Permitted	Average Total HCAD Valuation	Average cost of construction based on ICC unit cost	Average square feet
Floodway	64	$542,785	$360,266	3,649
100-year	4,482	$370,276	$329,067	3,333
500-year	3,921	$406,044	$329,166	3,334
Floodway+100-year+500-year	8,467	$388,144	$329,363	3,336
City wide	37,978	$428,734	$351,350	3,559

Table 10 – New Home Permits, Values and Square Footages (Houston Public Works ILMS Permit Records, 2017) (Harris County Appraisal District , 2017) (International Code Council, 2017)

Many of the new homes built in the floodplain are built on elevated floor foundations (such as pier and beam). The combination of the requirement to elevate and the zero net fill policy frequently make elevated floor foundations the best option for new homes in the floodplain under the current requirements. As shown in Chart 2, of the 1,857 new homes permitted in the 100-year floodplain in the last 5 years, 604 (32%) were built with slab on grade foundations and 1,253 (78%) were built on various types of elevated floor foundations. It is anticipated that most new homes built in the 100-year and 500-year floodplains under the proposed requirements will be built on elevated foundations.

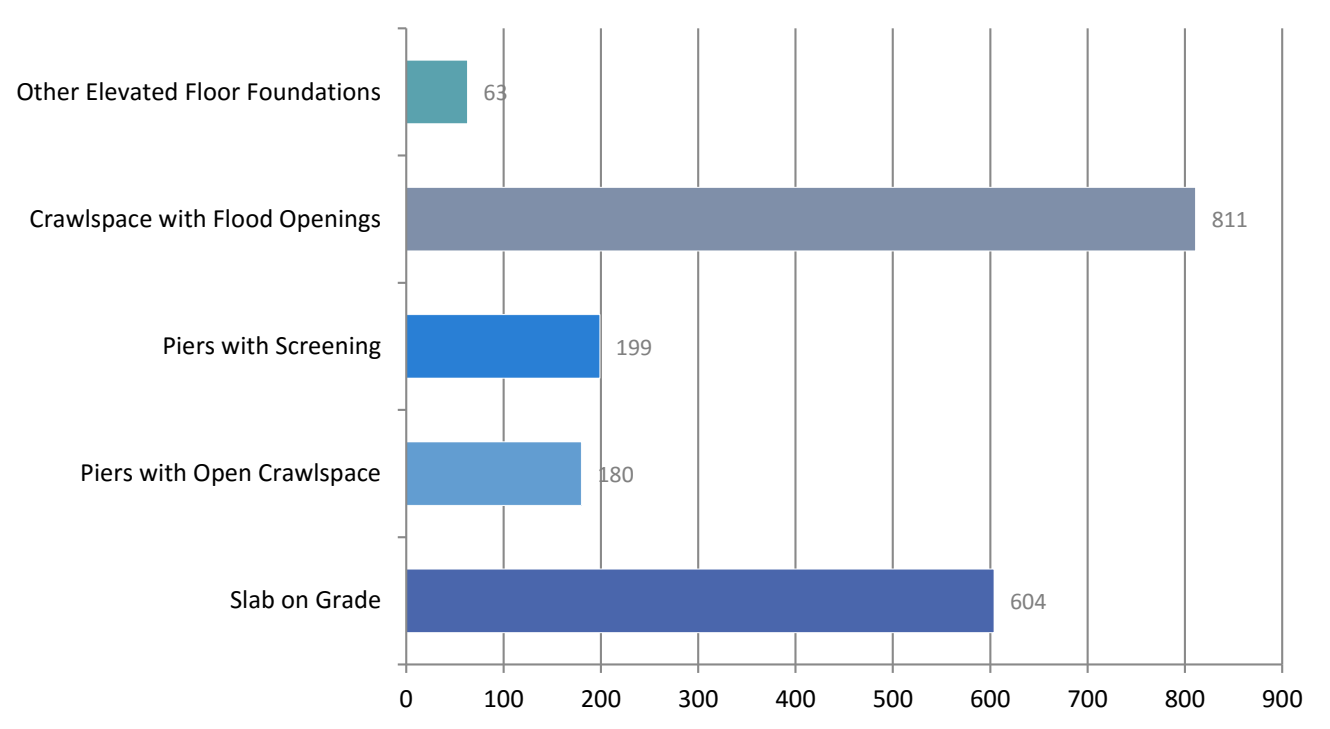


Chart 2 – Foundation Type of New Homes in the 100-year floodplain permitted 2013-2017 (Houston Public Works ILMS Permit Records, 2017) (FEMA Current Effective FIRM, 2018)

Home Addition Permits

In the last five years, 445 permits for home additions in the 100-year floodplain have been issued. (Houston Public Works ILMS Permit Records, 2017) In the same time frame, nine (9) variances were granted by the General Appeals Board to exempt disabled homeowners from the requirement to elevate their proposed additions. (Floodplain Management Office Variance Log, 2017) The opportunity for variances for disabled homeowners continues under the proposed changes to Chapter 19.

Height of Homes built to Proposed Elevation Requirements

To reduce the risk of flooding, the proposed changes will require new and replacement homes to be higher than previously required.

The height of homes built to the proposed elevation requirement, 2 feet above the 500-year flood elevation, varies depending on which bayou the home is near and on how close the home is to the flooding source (nearest bayou, creek or stream). The required height will be higher in areas subject to deeper flooding and lower in areas subject to shallower flooding. Figure 3 is an illustration of how the elevation requirement affects properties in different flood zones at different distances from the flooding source.

<Exhibit to be Inserted Here>

Figure 3 – Example of Height of Homes in various flood zones and distances from flooding source

Chart 3 shows how high all homes in the 100-year and 500-year floodplains would be required to be elevated if they were rebuilt under the proposed changes.

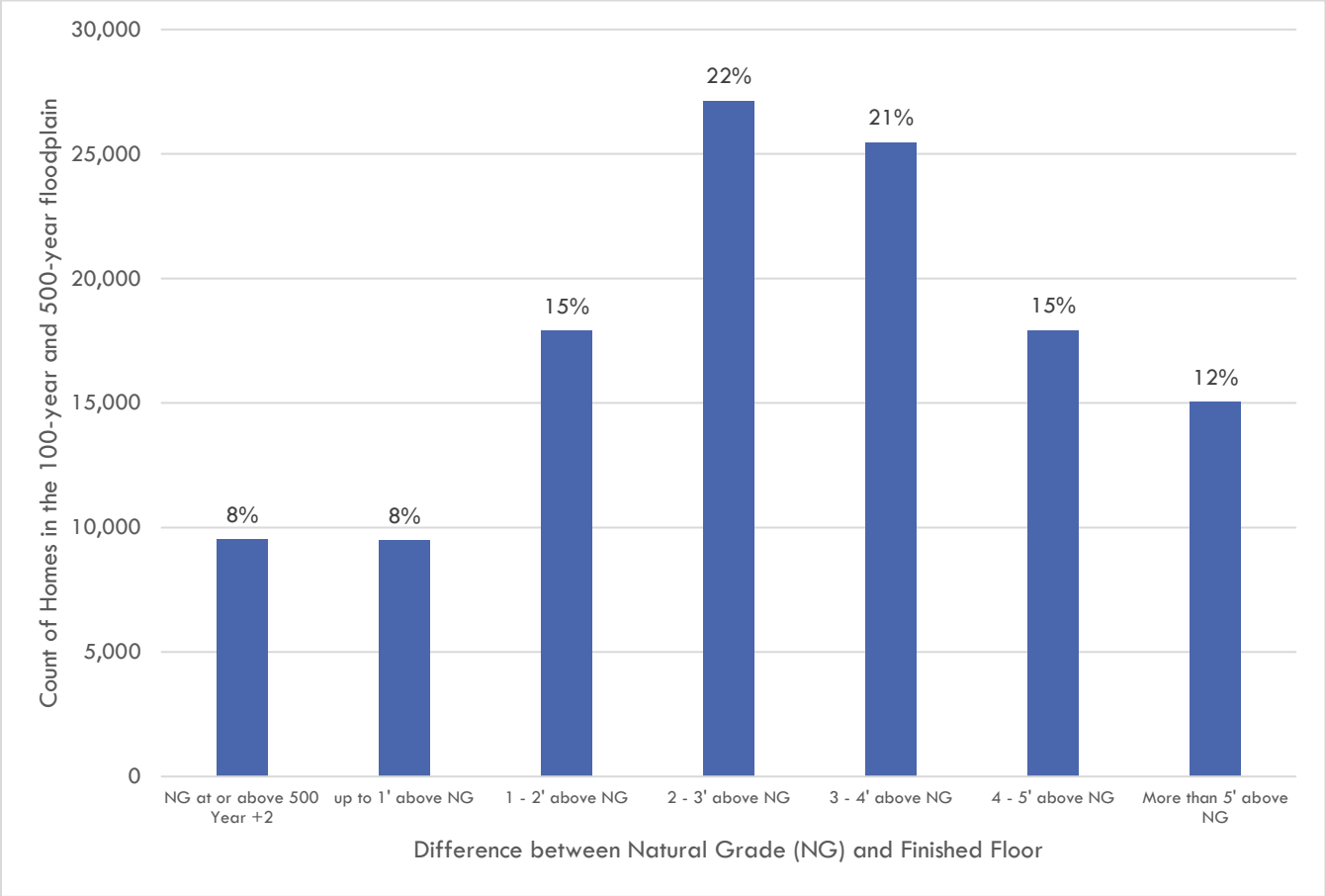


Chart 3 – Difference between Natural Grade and Finished Floor if all homes in the 100-year and 500-year floodplains were built to 500-year flood elevation +2 feet (Harris County Flood Control District, 2009) (FEMA Current Effective FIRM, 2018)

While homes with elevated lowest living floors are not typical in Houston, they are common in other parts of the country. Accessibility issues may be resolved with ramps, lifts and elevators if necessary. It is important to recognize that homeowners with accessibility issues are particularly vulnerable to flooding dangers and should not be put at a greater risk of flooding by failing to adequately elevate.

VII. COSTS AND SAVINGS

Construction Costs

The cost of additional elevation requirements varies based on the elevation of natural ground and the elevation of the 500-year flood elevation in each area.

The Greater Houston Builders Association (GHBA) completed a cost comparison of a home built with a conventional slab against a home built on a crawlspace using treated lumber to raise the home 2 feet above the 500-year flood elevation. The example home is a 1,650-square foot, one-story home with a 2-car garage and 150 square feet of outdoor space (porch/entry). According to GHBA, the example home in the 500-year floodplain will cost $32,064 more to build under the proposed requirements.

	Slab on Grade	Crawlspace	Example Additional Foundation Cost
Square Footage	1,650 SF	1,650 SF	-
Foundation Cost	$36,580	$68,644	$32,064

Table 11- GHBA Cost Estimate Comparison (Greater Houston Builders Association, 2018)

City of Houston Housing and Community Development Department (HCDD) also provided a cost comparison between similar homes built as part of an affordable housing project. One home was built on pier and bean and another using slab on grade. According to this analysis, the expected cost differential is about $10,990 or 6.3% of the total construction cost of the pier and beam home.

	Slab on Grade	Pier and Beam	Example Additional Foundation Cost
Square Footage	1,382 SF	1,450 SF	-
Foundation Cost	$17,762	$28,752	$10,990
Total Construction Cost (including demolition)	$163,884	$174,554	-
Foundation Cost as Percentage of Total Construction Cost	10.8%	16.5%	6.3%

Table 12 – HCDD Cost Comparison (Houston Housing and Community Development Department, 2018)

Building more resilient homes may be more expensive than continuing to build homes the way they have been built in the past. However, as regulations help to create demand for more resilient homes, costs are expected to decrease as technology and the expertise of builders improve.

Insurance Savings

Changes to Chapter 19 will have an influence on the cost and eligibility of Houston homeowners in the National Flood Insurance Program (NFIP) and Community Ratings System (CRS).

The City of Houston has participated in the NFIP since 1981 when the City adopted the first version of Chapter 19 of the Houston Code of Ordinances and the first FEMA provided Flood Insurance Rate Maps for Houston. There are over 132,620 active NFIP policy holders in Houston as of June 2017.

The NFIP provides subsidized Flood Insurance to participating communities. Participating communities are required to adopt and enforce minimum floodplain management standards.

Among these minimum standards is the requirement to elevate the lowest living floor of residential structures to at least base flood elevation. Base Flood Elevation (BFE) is the 100-year flood elevation. FEMA also requires communities participating in the NFIP have substantial damage and substantial improvement provisions in their development regulations. The City of Houston's current floodplain ordinance includes standards that exceed FEMA's minimum requirements, including the requirement to elevate the lowest living floor of residential structures to one foot above Base Flood Elevation, zero net fill in the 100-year floodplain, elevation requirements for critical facilities in the 100-year and 500-year floodplains and additional requirements in the conveyance zone and floodway.

Based on these higher standards and the City's other floodplain management practices, the City of Houston also participates in FEMA's Community Ratings System (CRS) program. CRS is a voluntary higher standards program that rewards participating communities with discounts for policy holders. The City of Houston has a class 5 rating resulting in up to 25% discounts for flood insurance policy holders in Houston. The City of Houston has the highest CRS rating of the nation's ten largest cities.

The City's participation in CRS saves NFIP policy holders in the 100-year floodplain an average of $296 per policy each year. CRS discounts citywide total over $13.3 million annually.

The City's NFIP participation and CRS discounts are summarized in the table below.

Zone	Total Number Policies	Total Premiums	Total CRS Discounts	Average Premium	Average CRS Discount
100-year	39,121	$37,341,288	$12,447,129	$955	$382
500-year + Outside	93,499	$41,055,921	$806,040	$452	$9
Total	132,620	$78,397,209	$13,253,169	$591	$119

Table 13 – NFIP Participation and CRS Savings (FEMA Community Information System, 2016)

Federal regulations require that homes in the 100-year floodplain with federally backed mortgages carry flood insurance. (42 USC 4001, 1973) The proposed changes to Chapter 19 do not expand the requirement for flood insurance to the 500-year floodplain.

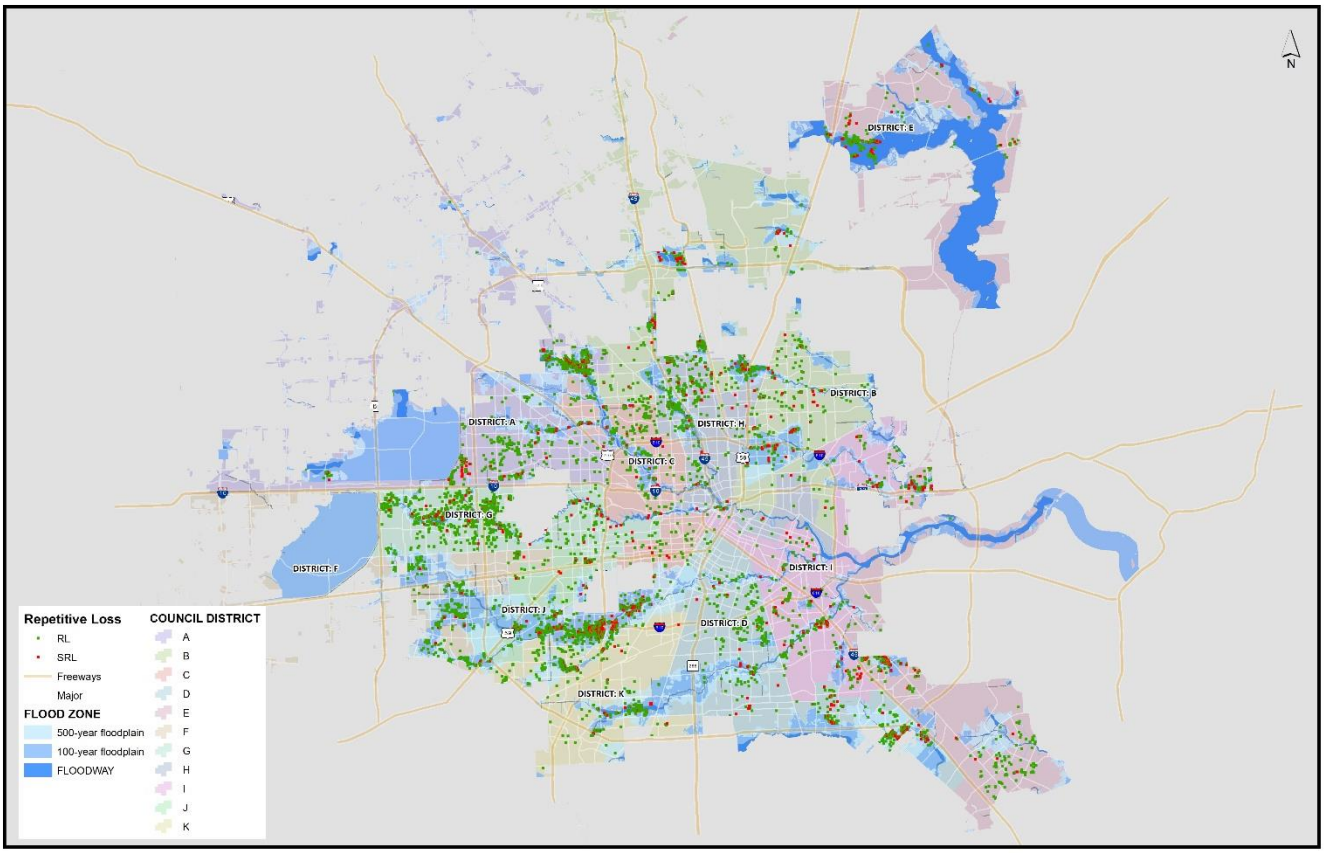
The proposed changes to Chapter 19 will not affect the cost of NFIP flood insurance for existing homes. New homes in the 100-year floodplain built to the proposed 500-year + 2 foot elevation requirement as opposed

to the current 100-year + 1 foot could save an average of $232 annually on insurance premiums. In the 500-year floodplain, homes that are built on elevated foundations will have slightly higher insurance costs as compared to homes with slab on grade foundations. See insurance changes summarized below:

	Harvey Flooded Homes Studied	Insurance Cost – 100-YEAR+1	Insurance Cost 500-year +2 feet	Average Annual Insurance Savings
100-year	25,852	$713	$481	$232
500-year	5,970	$344	$386	($42)

Table 14 – Insurance Impacts (NFIP Flood Insurance Manual, 2017)

Making two or more flood insurance claims may cause a property to be designated as a Repetitive Loss or Severe Repetitive Loss structure. A Repetitive Loss (RL) structure is a structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978. A Severe Repetitive Loss (SRL) structure is a structure for which 4 or more separate NFIP claim payments have been made with the amount of each such claim exceeding $5,000, and with the cumulative amount of the claims payments exceeding $20,000; or for which at least 2 separate NFIP claims payments have been made with the cumulative amount of the claim payments exceeding the pre-flood market value of the structure. (FEMA, 2017) These flood losses must have occurred within any 10-year period since 1978. As of December 2017, the City of Houston has 2,015 SRL and 6,613 RL properties as shown in the below map.



Map 6 – Severe Repetitive Loss and Repetitive Loss (FEMA Current Effective FIRM, 2018) (FEMA Repetitive Loss Data, 2017)

SRL homeowners are subject to much higher premiums and rate increases of 25% per year until full risk rates are reached based on the provisions of recent federal legislation that became effective in 2015. The chart below illustrates the changes in base flood insurance premiums (before surcharges and discounts) for a slab on grade home built before 1981 (pre-FIRM). (FEMA HFIAA, 2014)

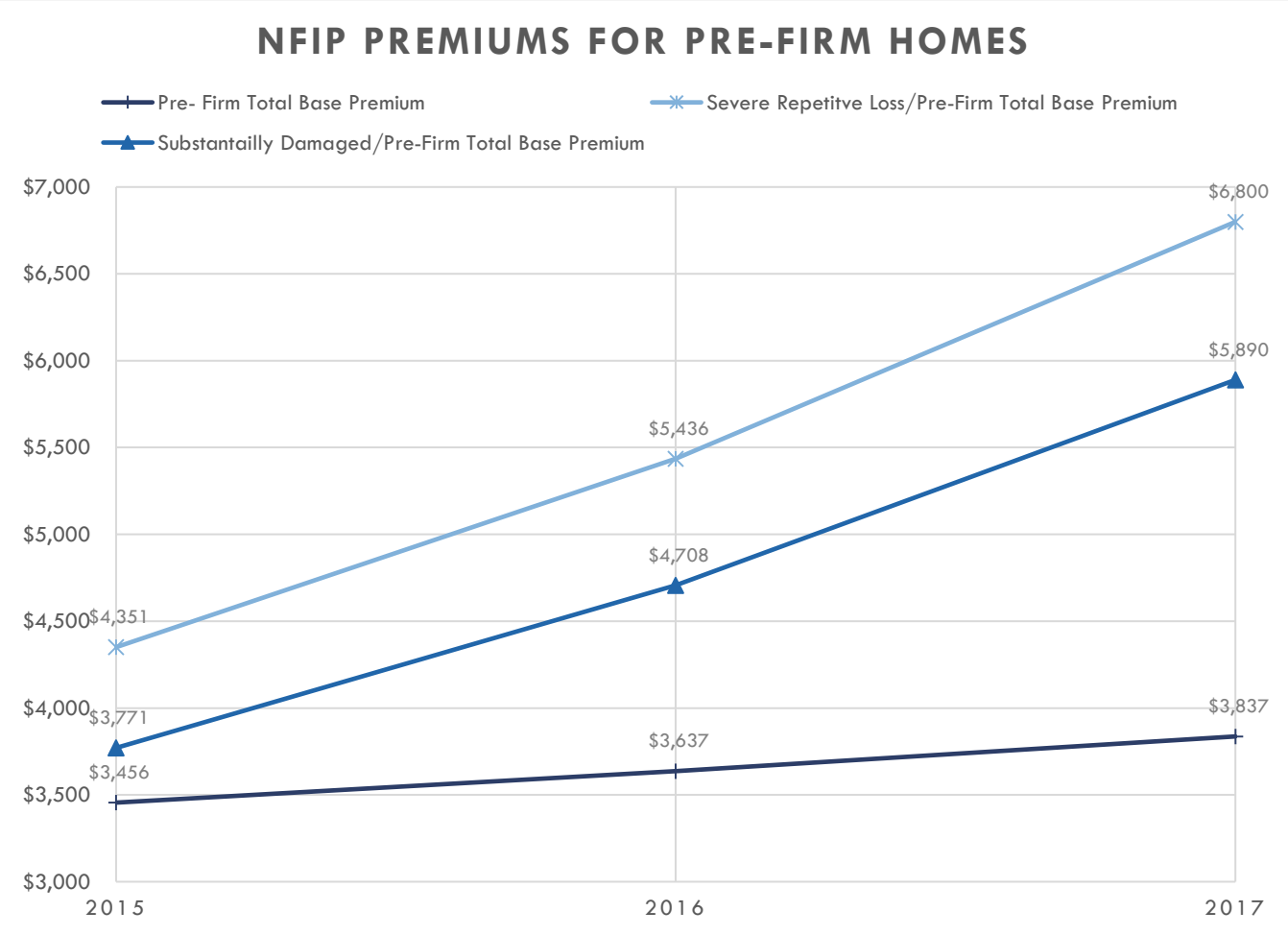


Chart 4 – NFIP Premium Increases for Severe Repetitive Loss properties and Substantially Damaged Properties (NFIP Flood Insurance Manual, 2017) (NFIP Flood Insurance Manual, 2016) (NFIP Flood Insurance Manual, 2015)

Better protecting homes from flooding with the changes to Chapter 19 will help to avoid substantial damage and Severe Repetitive Loss in new homes. This will save new home owners from significant NFIP premium increases.

The proposed changes to Chapter 19 may provide enough points to upgrade the City's CRS rating to Class 4 (which equates to an additional 5% discount on standard rate NFIP policies with average potential savings of $64 annually for policies in the 100-year floodplain) assuming all prerequisites are met and depending on how the proposed exemption for small additions is scored. Meeting the prerequisites for a Class 4 rating requires changes to the City's storm water management regulations and the acceptance of a watershed master plan by FEMA. (FEMA Community Rating System Coordinator's Manual, 2017)

The proposed changes will allow homeowners in the 100-year floodplain to use Increased Cost of Compliance Coverage to elevate or rebuild their substantially damaged homes higher than 1 foot above base flood elevation. The proposed changes would require that any federal grant-funded home elevation or mitigation reconstruction projects be elevated to the proposed minimum flood protection elevation, 2 feet above the 500-year flood elevation.

Overall the proposed changes will contribute to flood insurance savings and will not negatively impact CRS participation.

Avoided Cost of Flooding

According to FEMA, homes at the 100-year flood elevation have at least a 1% chance of flooding in any given year. Over the course of a 30-year mortgage, there is at least a 26% chance of the 100-year flood event occurring at least once. Lower-lying homes closer to the flooding source may have a much higher chance each year of flooding. For example, homes at the 10-year flood elevation have a have at least a 96% chance of flooding at least once over the course of a 30-year mortgage.

The average NFIP claim paid in Harvey in the 100-year and 500-year floodplains was $106,355. Of the 58,960 impacted homes in the 100-year and 500-year floodplains, 18,869 NFIP claims were made following Harvey. (NFIP Flood Insurance Manual, 2017) 68% of owners of impacted homes do not have flood insurance and must use their own resources to rebuild after a flood.

The cost of flood damage repair for the 31,822 flooded homes studied in the 100-year and 500-year floodplains was calculated using the USACE Depth Damage Curve. The average cost of flood damage repair in the 100-year and 500-year floodplains was $56,297. (United States Army Corps of Engineers, 2017) (Houston Public Works, 2017) (City of Houston, 2017) (Harris County Flood Control District, 2009) (Harris County Flood Control District, 2009)

The various estimated flood damage repair costs are shown in the below table. Average cost of flooding per home could only be calculated for homes with finished floor and high water mark data.

Floodplain	Flooded Homes Studied	Total Cost of Flooding	Average Cost of Flooding Per Home
100+500-year	31,822	$1,791,499,027	$56,297

Table 15 – Flood Damage Repair Costs (United States Army Corps of Engineers, 2017) (Houston Public Works, 2017) (City of Houston, 2017) (Harris County Flood Control District, 2009) (Harris County Appraisal District , 2017)

It should be noted that the above estimated costs are for flood damage repair to the homes. Significant additional costs are incurred by homeowners affected by flooding including replacement of flood damaged contents and temporary living expenses while flood damage repairs are underway.

Individual Assistance payments are limited to $33,400 regardless of flood damage sustained. For uninsured residents, the cost of flood damage repair may exceed IA payments.

Emotional and Psychological Impacts

Along with the financial costs of flooding, some flood damaged homeowners experience significant emotional and psychological impacts. According to "The effects of flooding on mental health: Outcomes and recommendations from a review of the literature" by Carla Stanke, Virginai Murray, Richard Armlot, Dr. Jo Nurse and Professor Richard Williams:

> **"While most people who are involved in disasters recover with the support of their families, friends and colleagues, the effects on some people's health, relationships and welfare can be extensive and sustained. Flooding can pose substantial social and mental health problems that may continue over extended periods of time. Flooding can challenge the psychosocial resilience of the hardiest of people who are affected." (Stanke, 2012)**

The City of Houston has a responsibility to make policies and regulations to protect the safety, health, welfare and property of its citizens. The Floodplain Ordinance should reflect this goal.

VIII. CONCLUSIONS AND RECOMMENDATIONS

This study reveals and acknowledges areas of uncertainty in the data – especially with regard to the assessment of future weather events, quantification of risks, individual homeowner choices, and inherent unpredictability of flooding disasters.

However, analysis of the available data clearly shows that changes to Chapter 19 regulations can make a significant contribution toward adequately protecting Houston's residents from future flooding. An even deeper dive into the currently proposed changes – i.e. for new homes in the 100- and 500-year floodplains to be elevated 2 feet above the 500-year flood elevation – confirms that the proposal strikes a reasonable balance between benefits and potential costs – public as well as private.

Houston Public Works recommends implementation of changes to Chapter 19 regulations in line with the conclusions of this analysis.

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X. APPENDIX

Appendix A – Summary of Data Sets used for Hurricane Harvey Housing Damage Update

Appendix B – Acreage and parcels in the 100-year and 500-year floodplains

Appendix C – Sample Cross Sections Cross Section Data – proposed requirement for elevation compared to NG and Harvey HWM

Appendix D – GHBA Cost Estimate Comparison

Appendix E – HCDD Cost Comparison

Appendix A – Summary of Data Sets used for Hurricane Harvey Housing Damage Update (City of Houston, 2017)

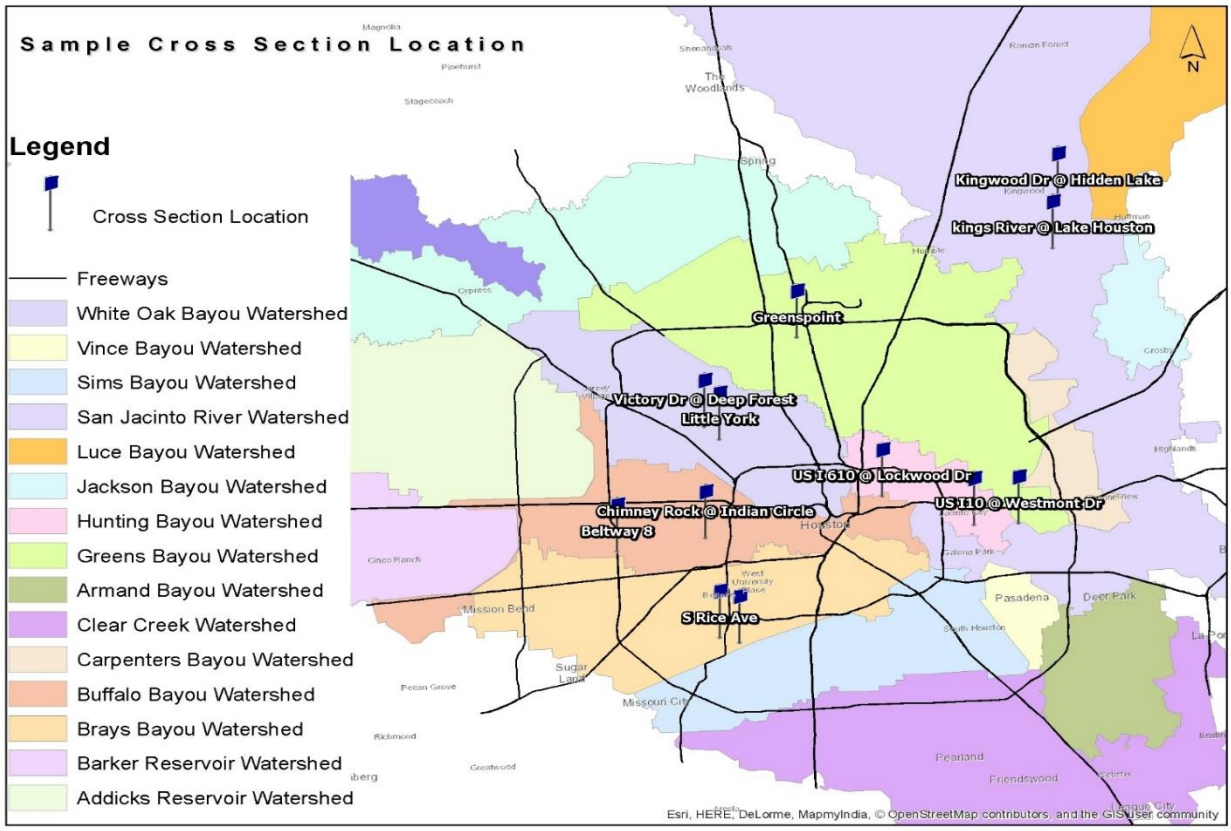
Data Set	**Brief Description**
City of Houston Public Works and Engineering Floodplain Management Office Visual High Water Mark Inspection Data	Visual inspection of all structures inside the 100-year floodplain, and when a water mark was present, and measurement was taken
City of Houston Solid Waste Department Debris Collection Data	Geolocated data based on where debris was picked up by Solid Waste Trucks
City of Houston Department of Neighborhoods Windshield Inspection Data	Visual inspection of external damage by Department of Neighborhoods employees
City of Houston 911 Emergency Call Data for Flood Rescues	Geolocated calls for flood rescue by citizens
City of Houston 311 Data for Harvey-Related Calls	Geolocated calls for flooding by citizens
City of Houston Public Works and Engineering Multi-Family Habitability Master List with Unit Count	Address-based data set that tracks all multi-family structures and number of units
FEMA NFIP Claims Data	Flood insurance claims information collected by FEMA
FEMA IA Data	Individual assistance data collected by FEMA

Appendix B – acreage and parcels impacted in 100- and 500-year floodplains.

Floodplain	Existing	Proposed
100-year	101,246 parcels 117,240 acres	101,246 parcels 117,240 acres
500-year	0 parcels 0 acres	85,739 parcels 33,615 acres
Total	101,246 parcels 117,240 acres	186,985 parcels 150,855 acres

Impacted Acreage and Parcels (Harris County Appraisal District , 2017) (FEMA Current Effective FIRM, 2018)

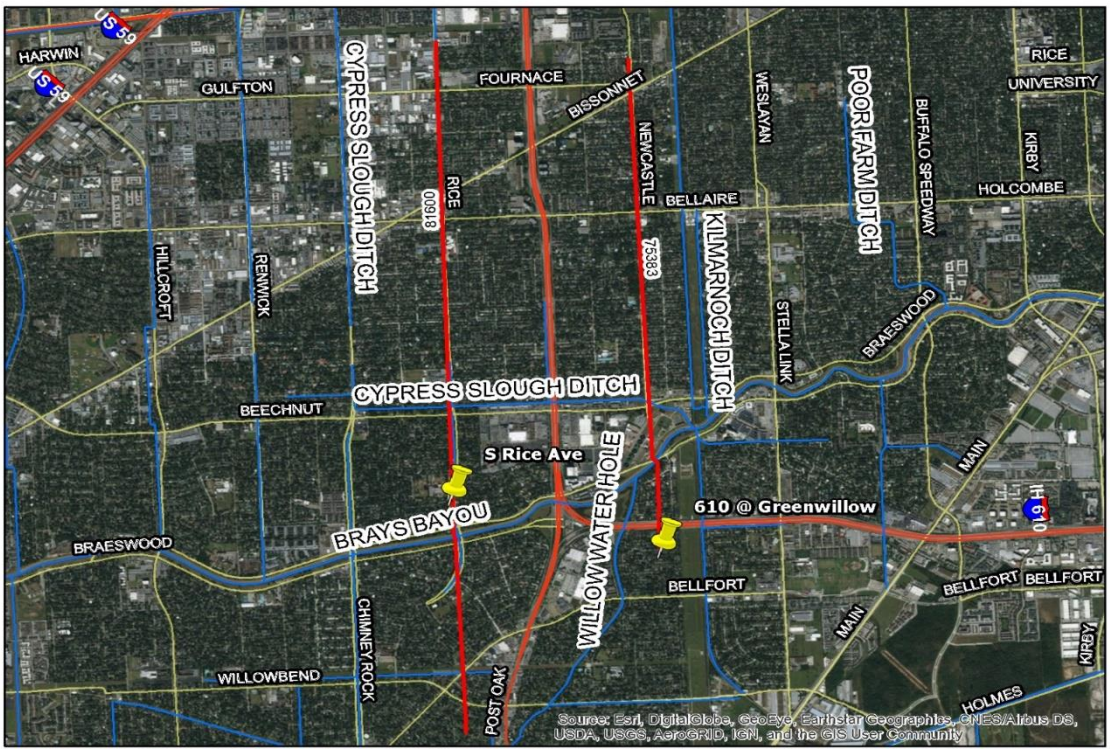
Appendix C – Additional Cross Section Data (proposed requirement for elevation compared to NG and Harvey HWM)

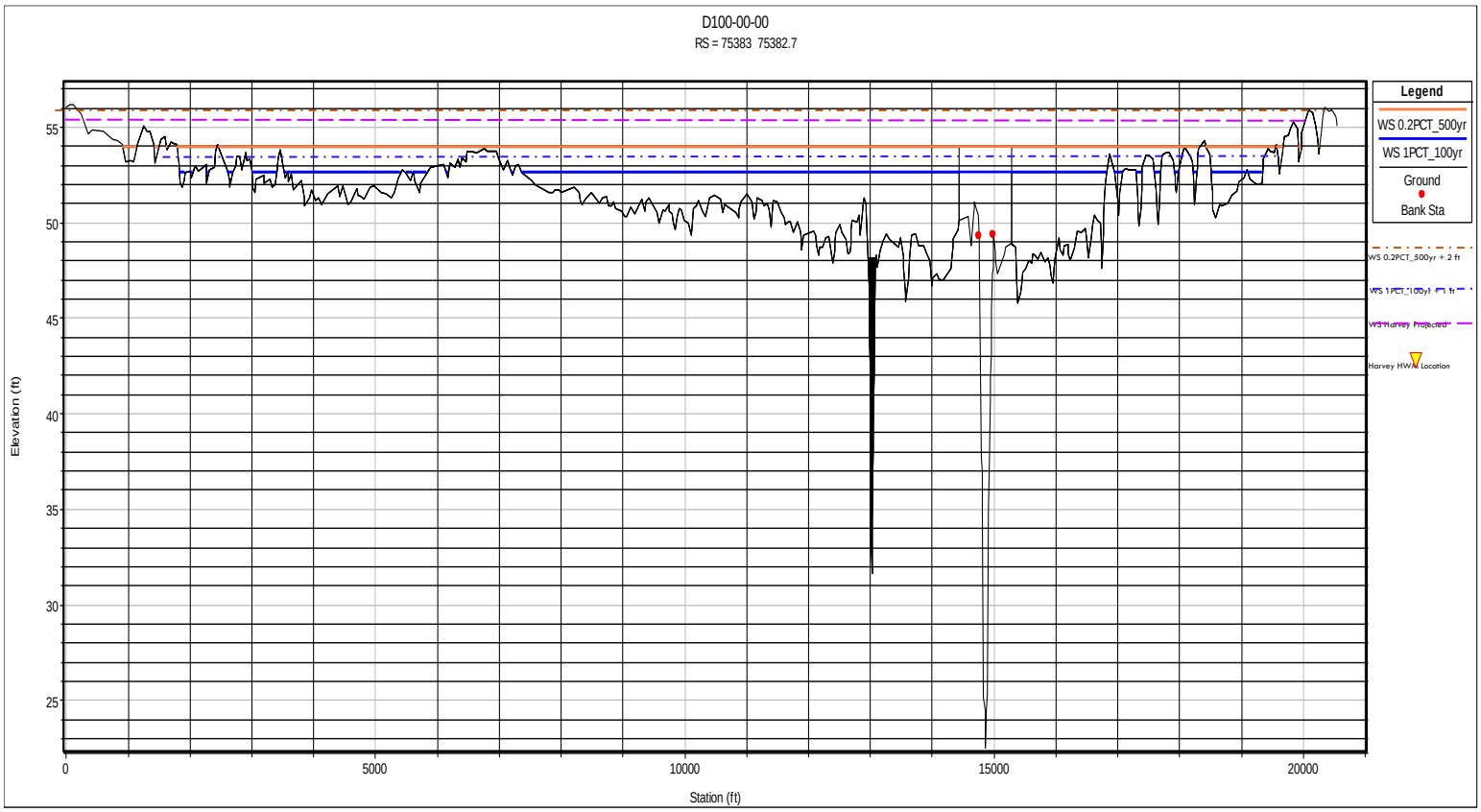


Location Description	Stream Name	FIS Stream Letter	NG near Harvey HWM (ft)	100-year WSEL (ft)	500-year WSEL (ft)	Harvey HWM (ft)	NG to 100-year + 1 (ft) (Ground above WSEL)	NG to 500-year +2 (ft) (Ground above WSEL)	NG to Harvey High Water Mark (ft)
S Rice Ave	D100-00-00	BN	52	54.87	56.18	55.58	2.87	6.18	3.58
US I 610 @ Greenwillow St	D100-00-00	BH	52	52.6	53.98	55.42	0.6	3.98	3.42
BELTWAY 8 @ Briar Hill Dr.	W100-00-00	CR	68	65.32	69.25	72.79	-2.68	3.25	4.79
Chimney Rock @ Indian Cir	W100-00-00	AZ	54	47.28	52.87	58.48	-6.72	0.87	4.48
Little York @ TC Jester Blvd	E100-00-00	Not Lettered	75	74.34	75.12	76.39	-0.66	2.12	1.39
Victory Dr. @ Deep Forest	E100-00-00	BO	75	78.78	78.99	78.8	3.78	5.99	3.8
US I-10 @ John Ralston Rd	H100-00-00	AC	26	26.1	28.78	30.05	0.1	4.78	4.05
US I 610 @ Lockwood Dr.	H100-00-00	Not Lettered	42	45.2	46.95	49.14	3.2	6.95	7.14
Kingwood Dr. @ Hidden Lakes	G103-80-00 (EFSJ)	H	58	53.51	57.85	58.14	-4.49	1.85	0.14
Kings River Dr. @ Lake Houston	G103-00-00 (WFSJ)	A	53	50.03	54.17	55.21	-2.97	3.17	2.21
Greenspoint	P100-00-00	FE	77	81.05	82.63	83.91	4.05	7.63	6.91
US I 10 @ Westmont Dr.	P100-00-00	T	22.5	19.08	21.88	23.87	-3.42	1.38	1.37

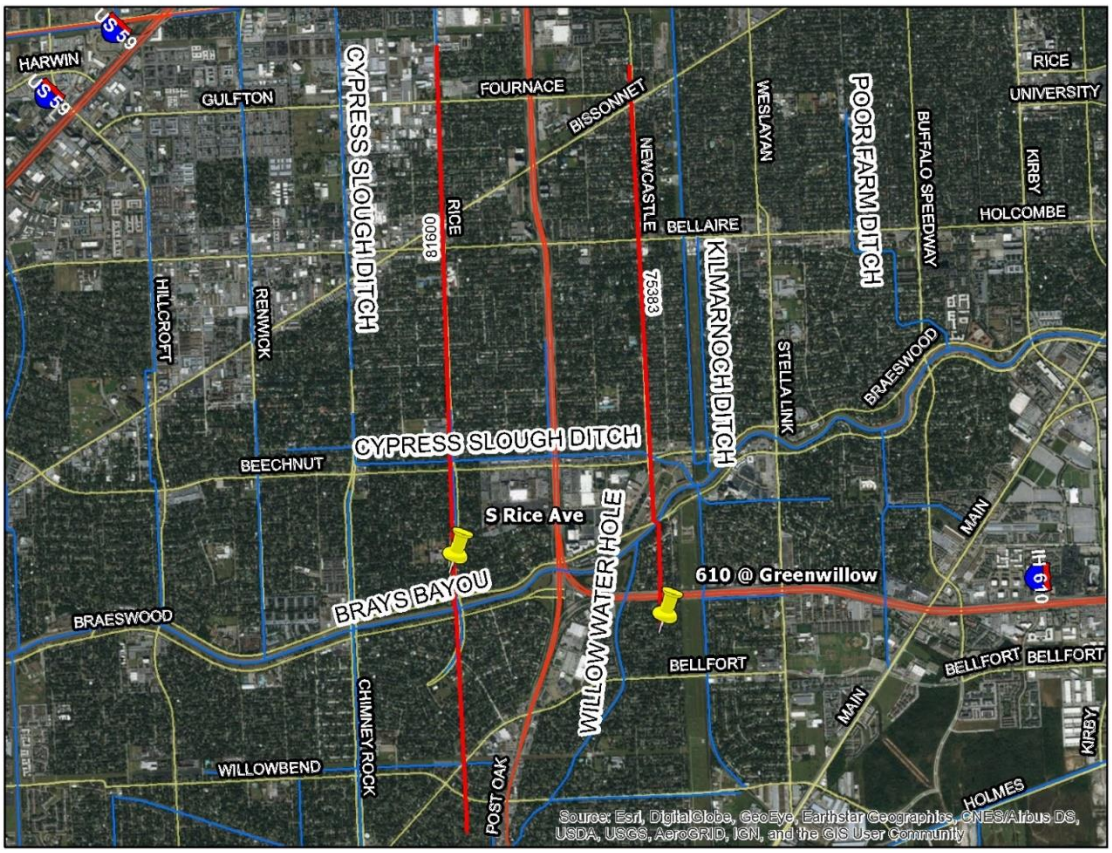
Maps and profiles follow for each sample location.

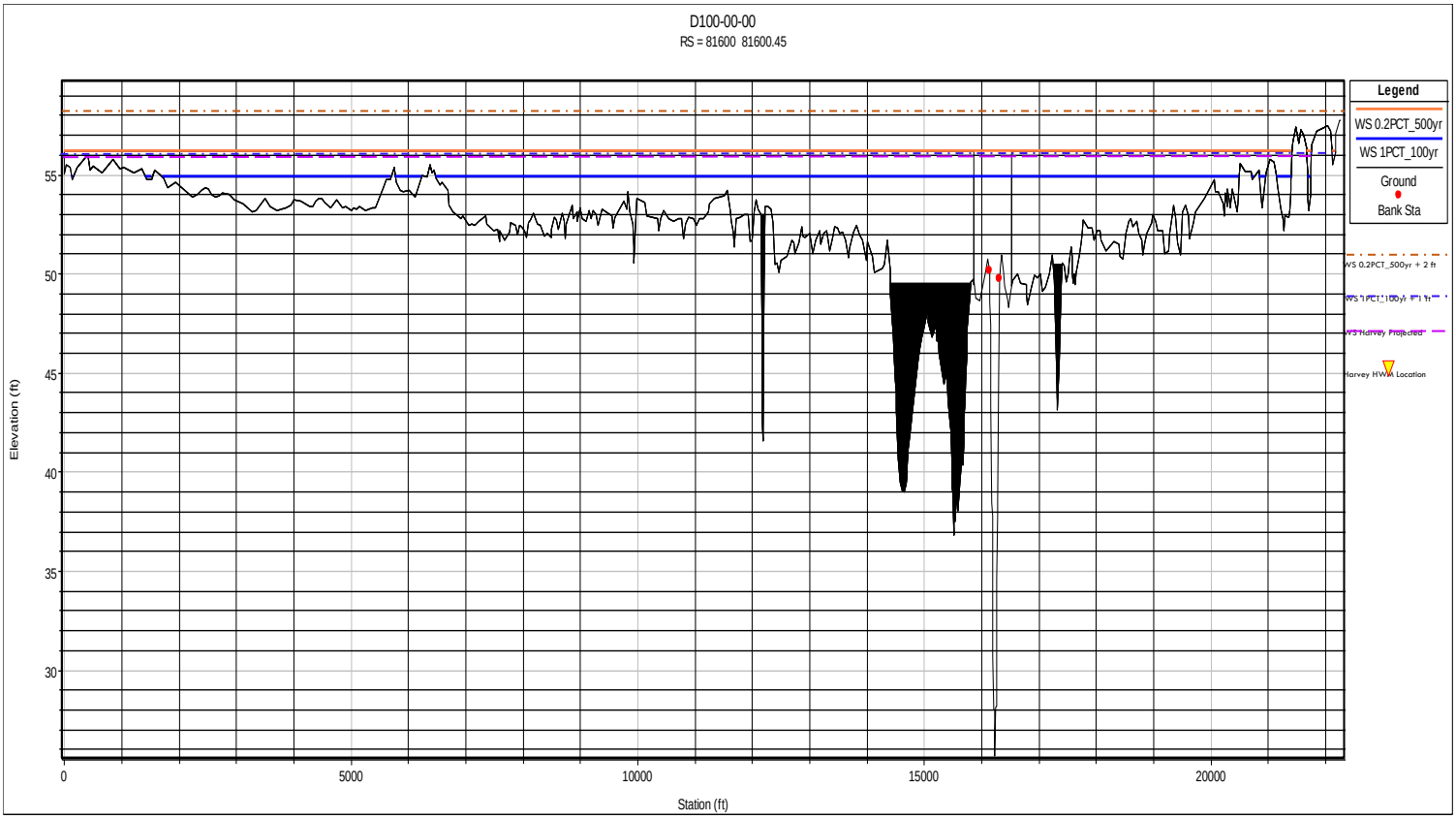
Appendix C - BRAYS WATERSHED



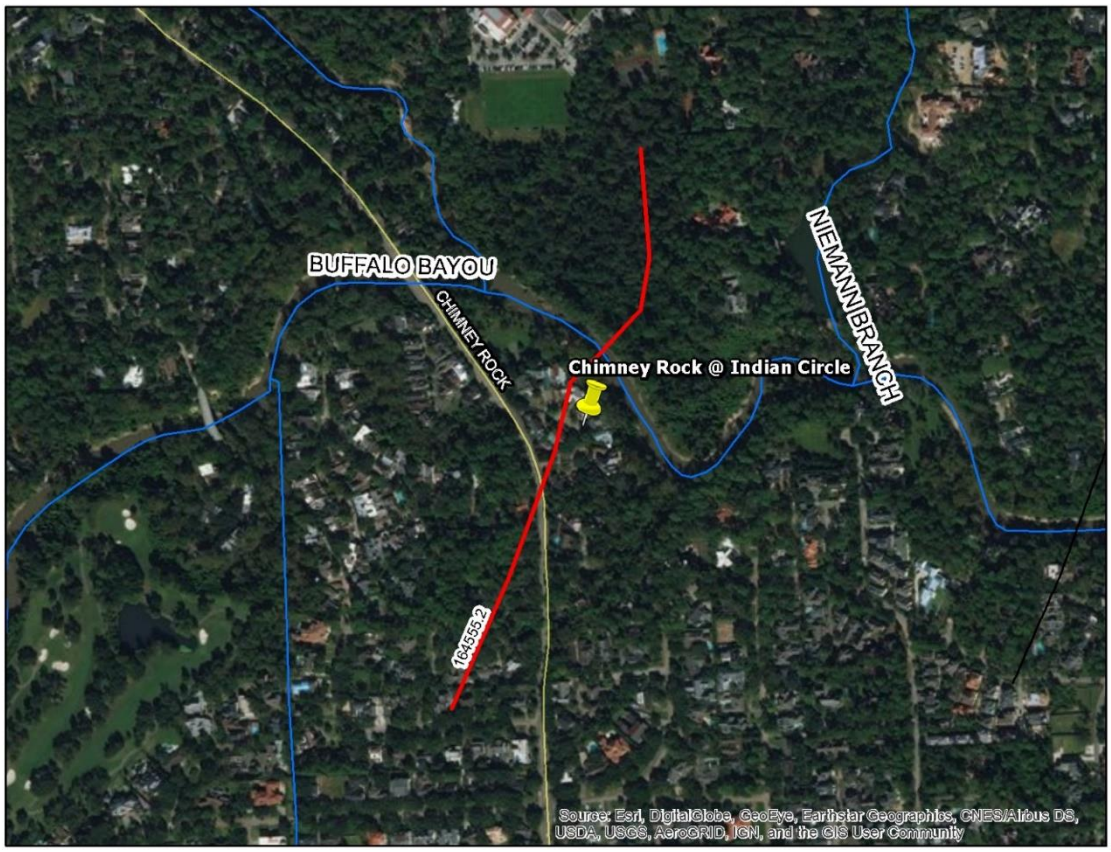


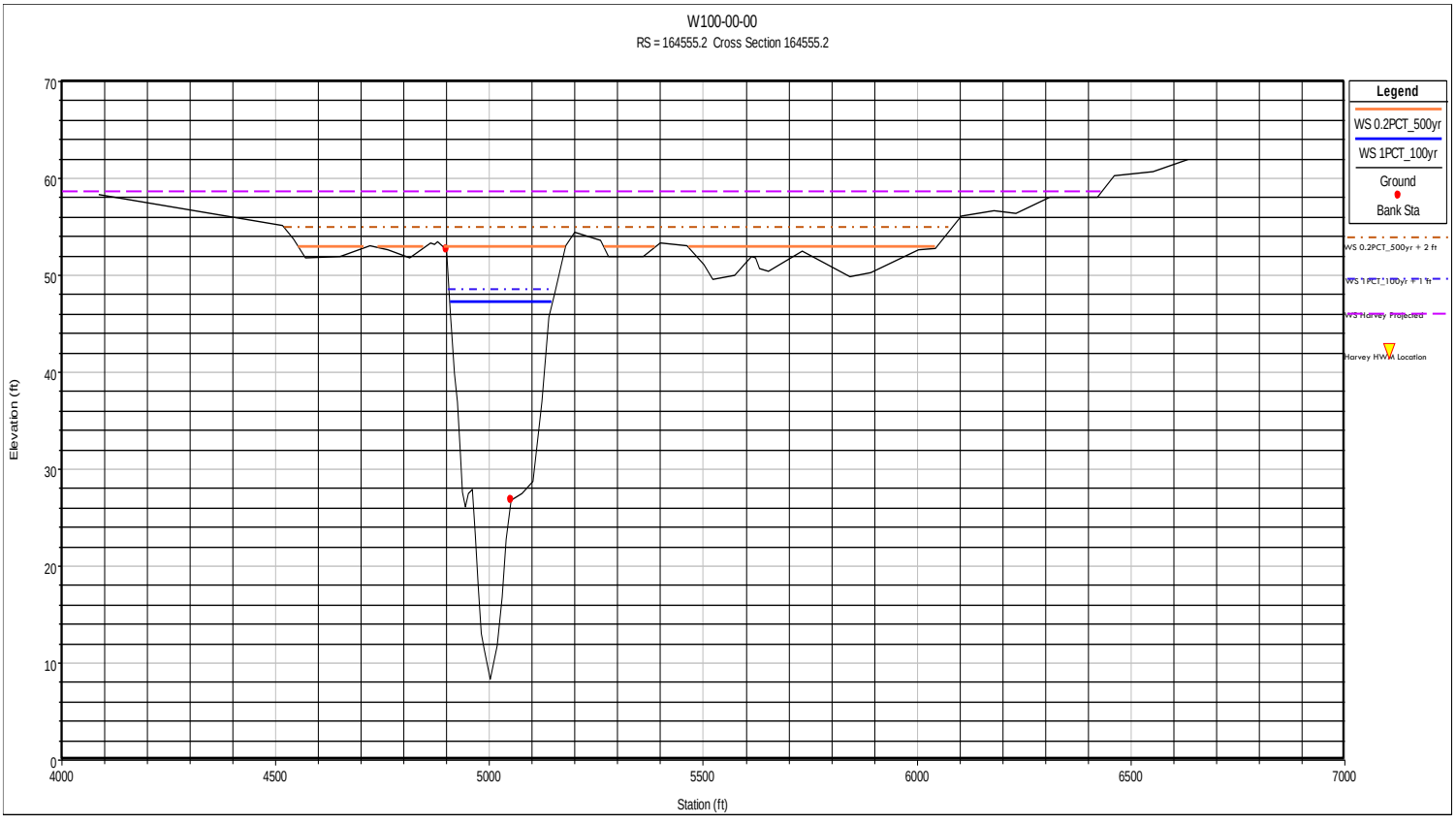
Appendix C - BRAYS WATERSHED CONTINUED





Appendix C - BUFFALO WATERSHED





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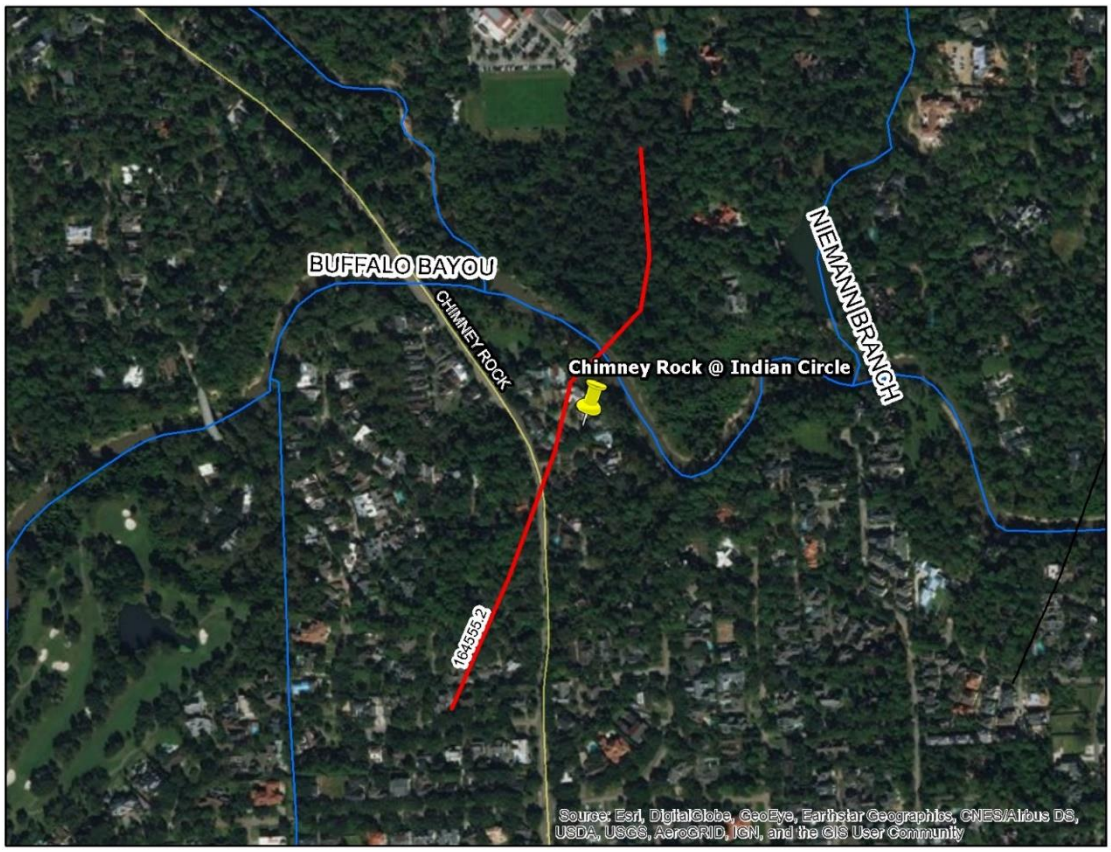

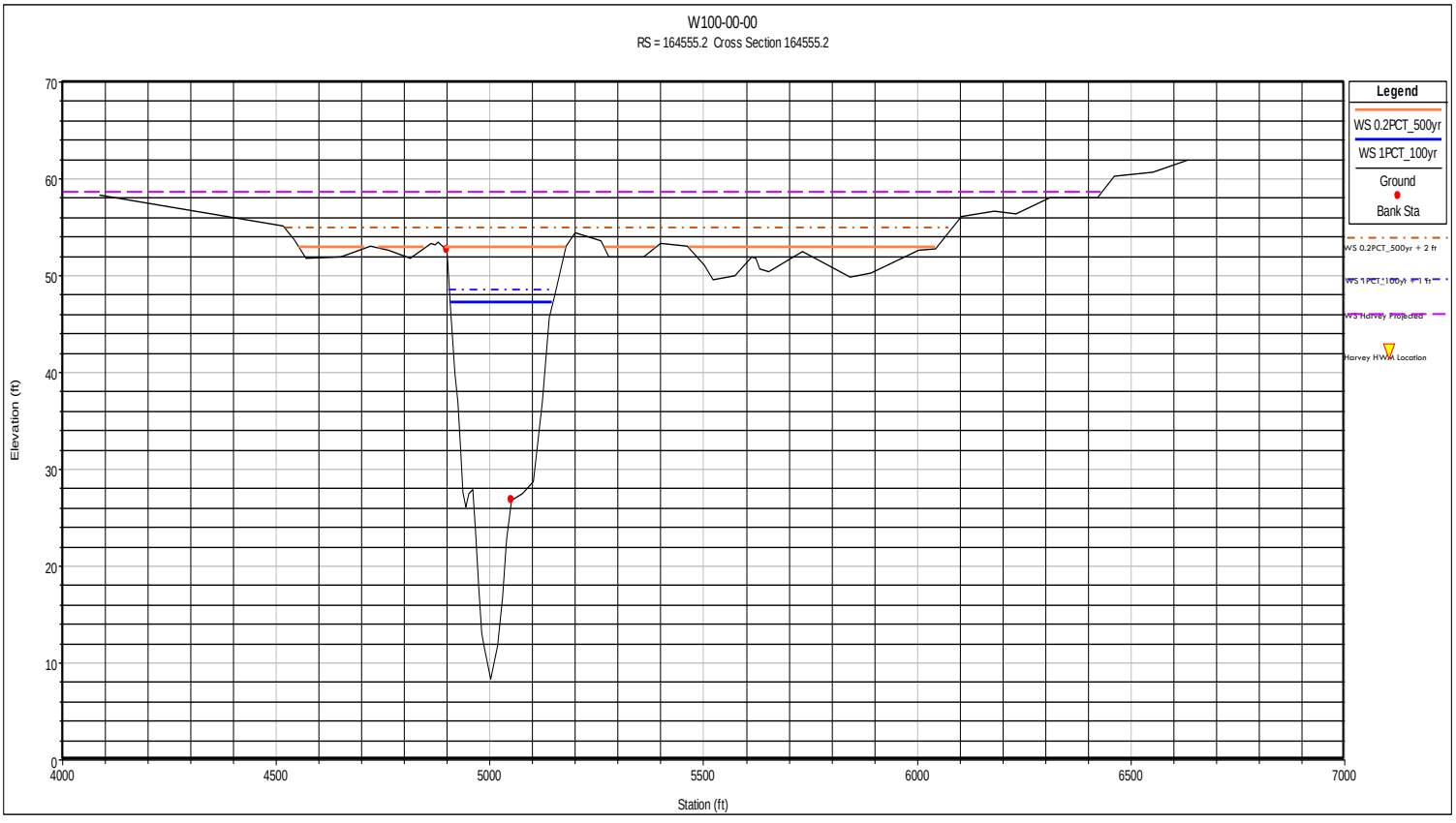

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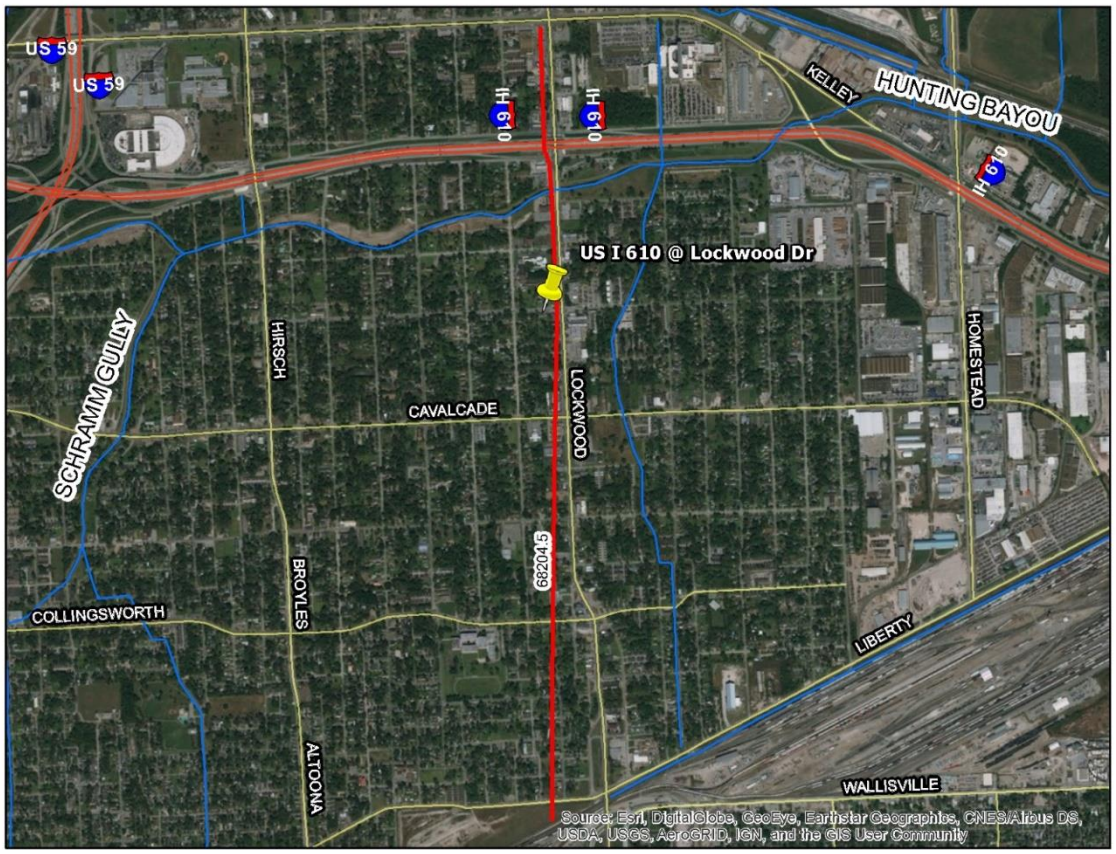

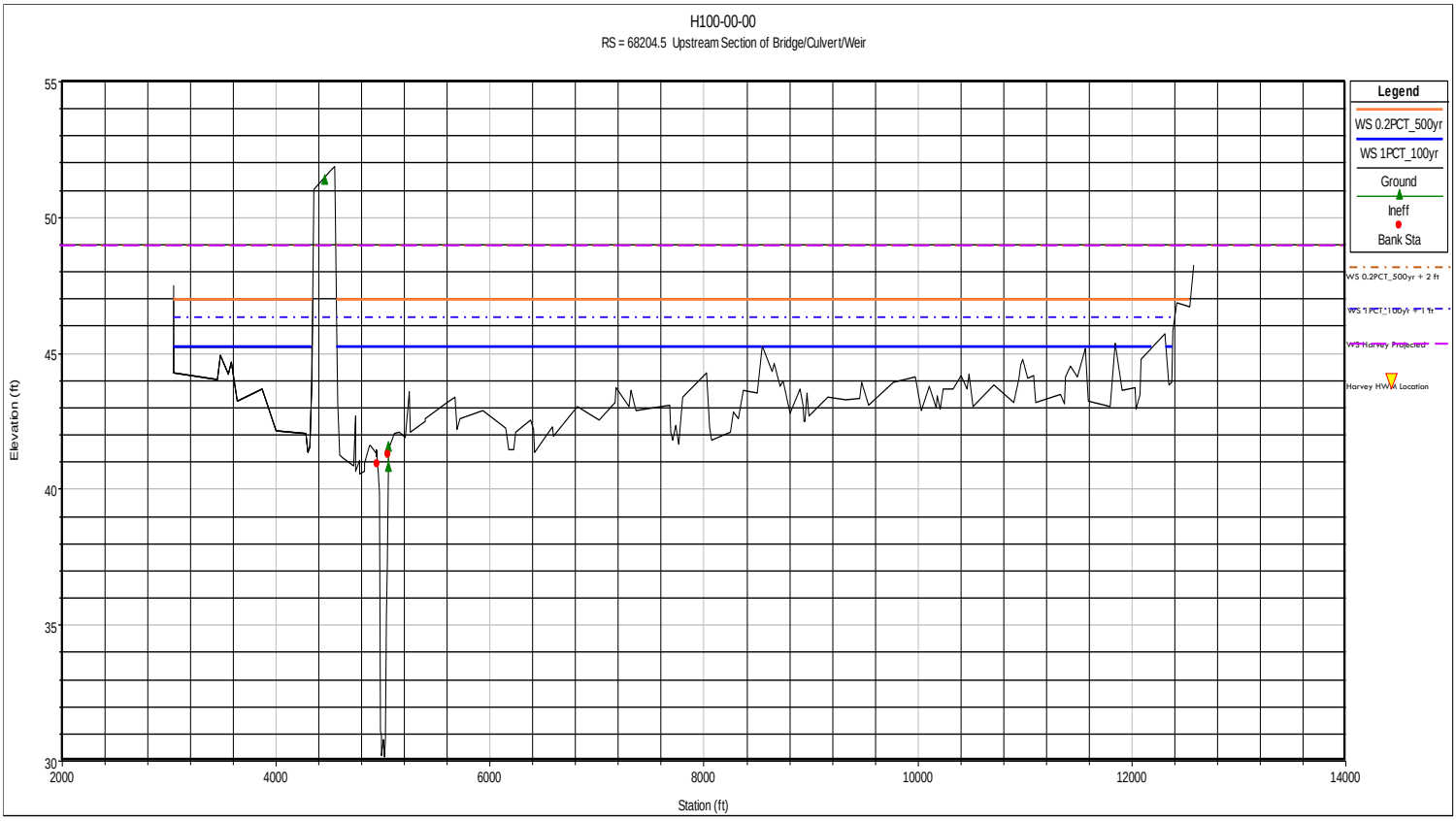

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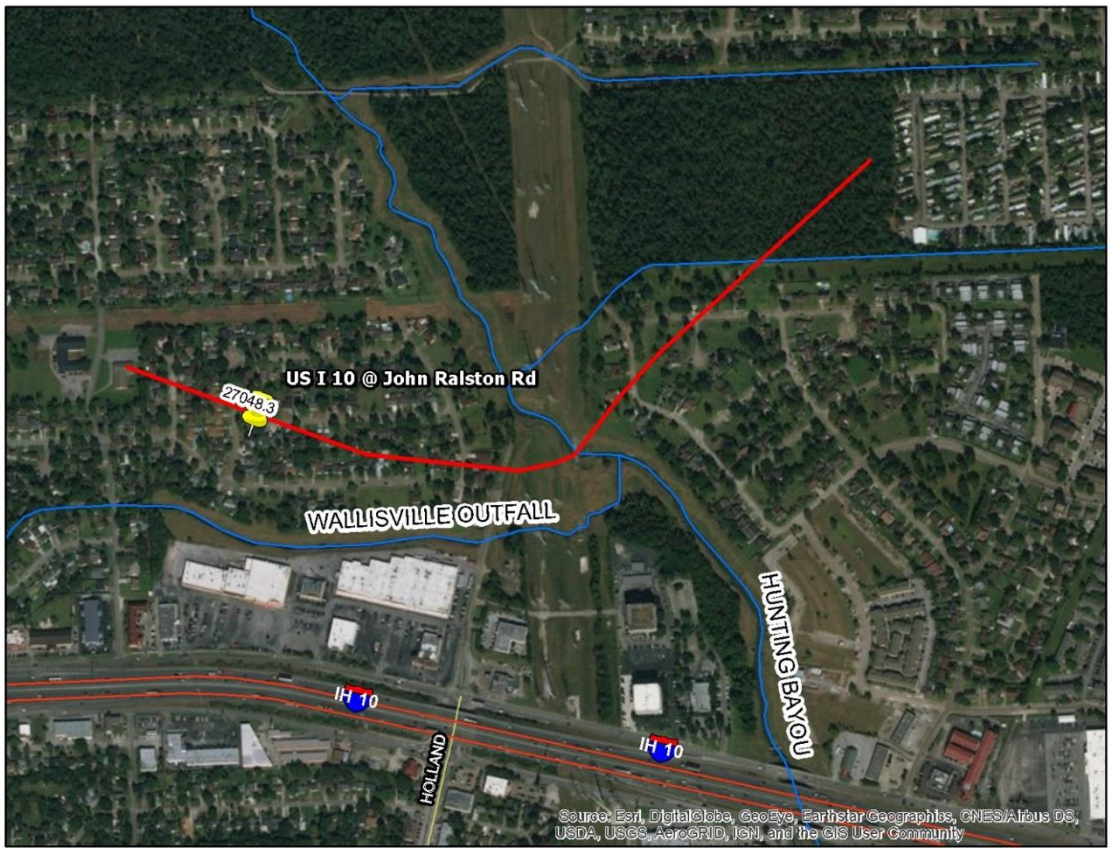
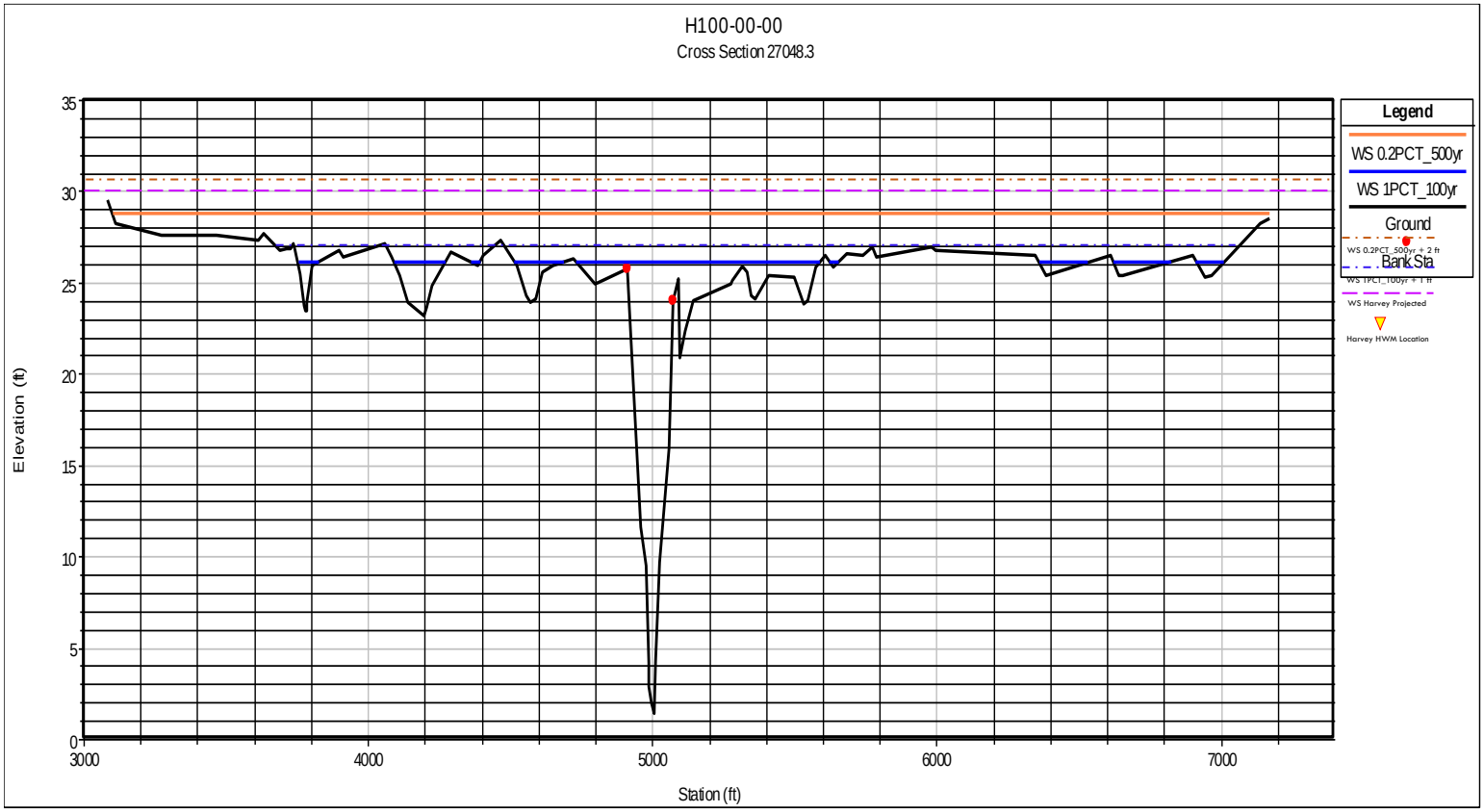
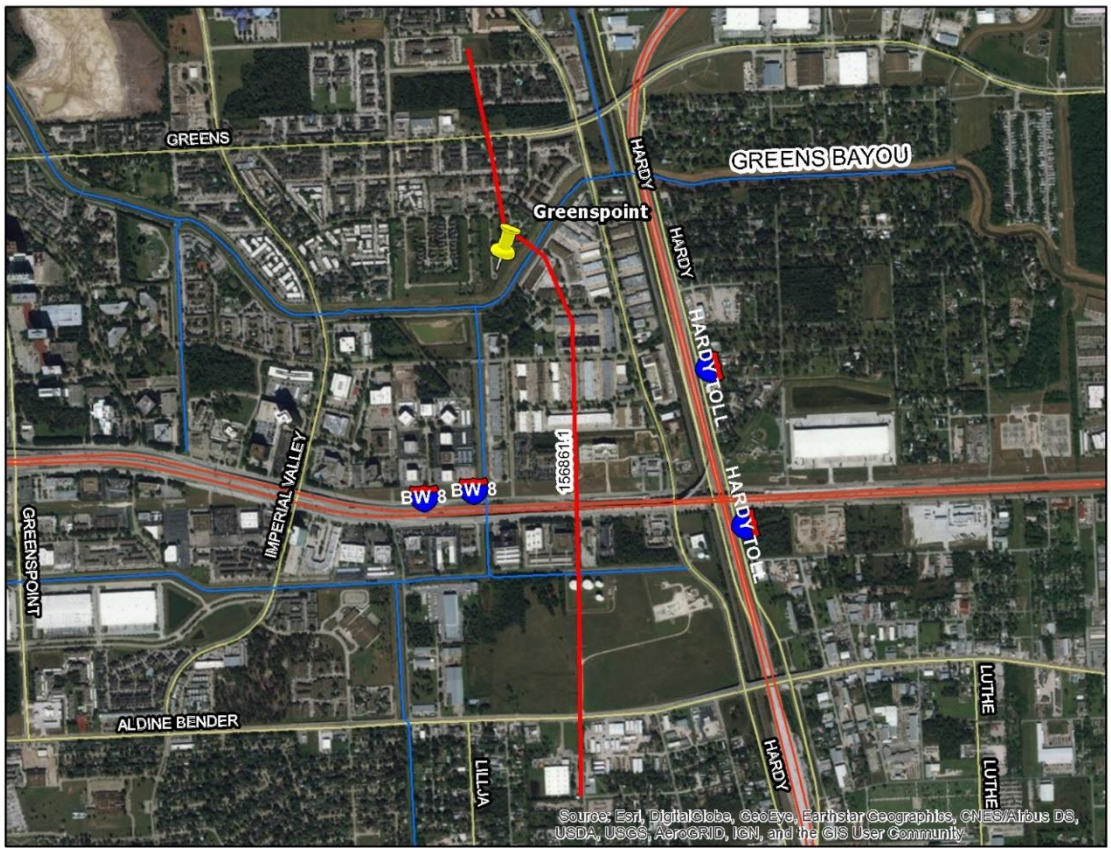
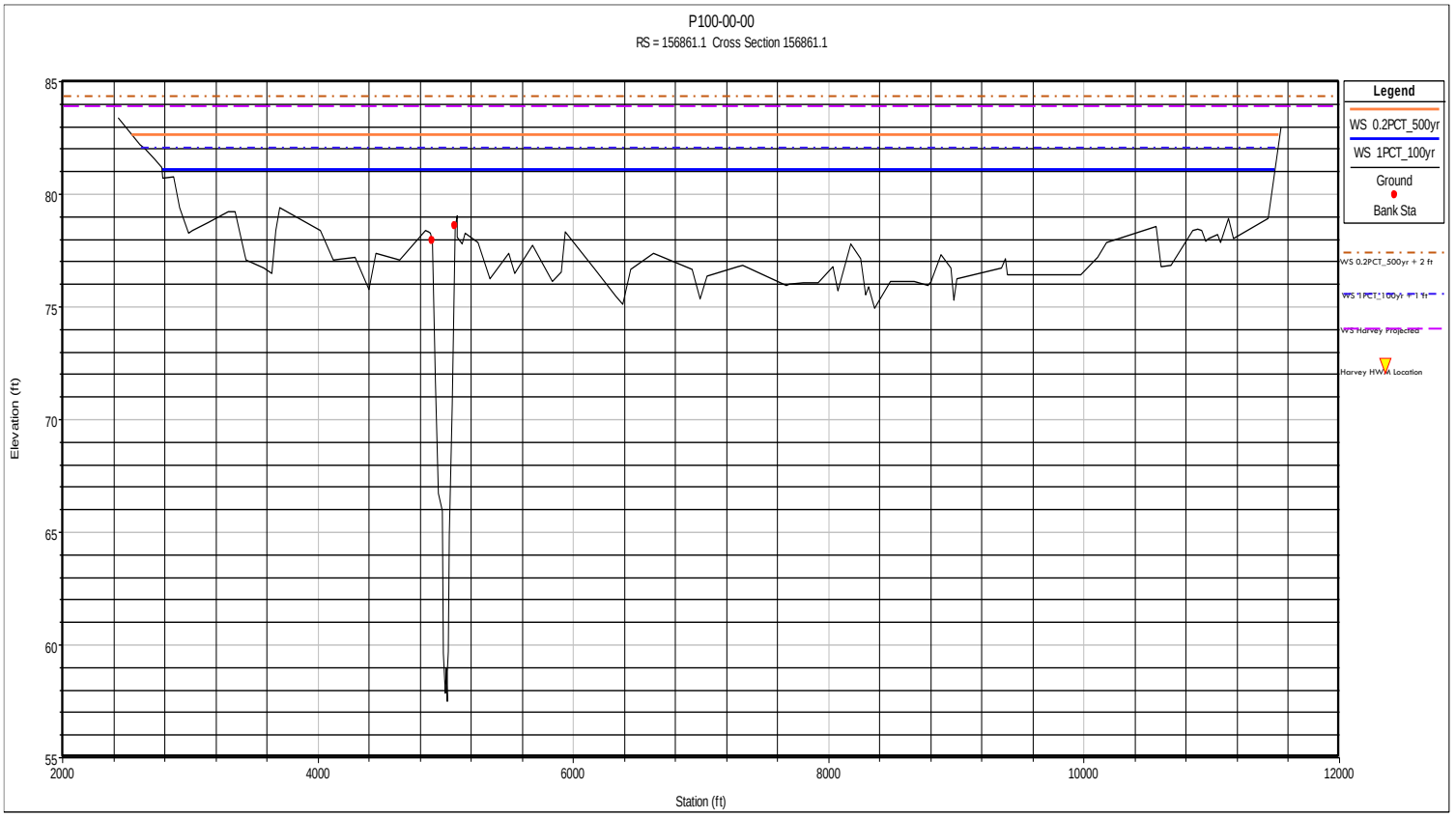




Appendix C - GREENS WATERSHED





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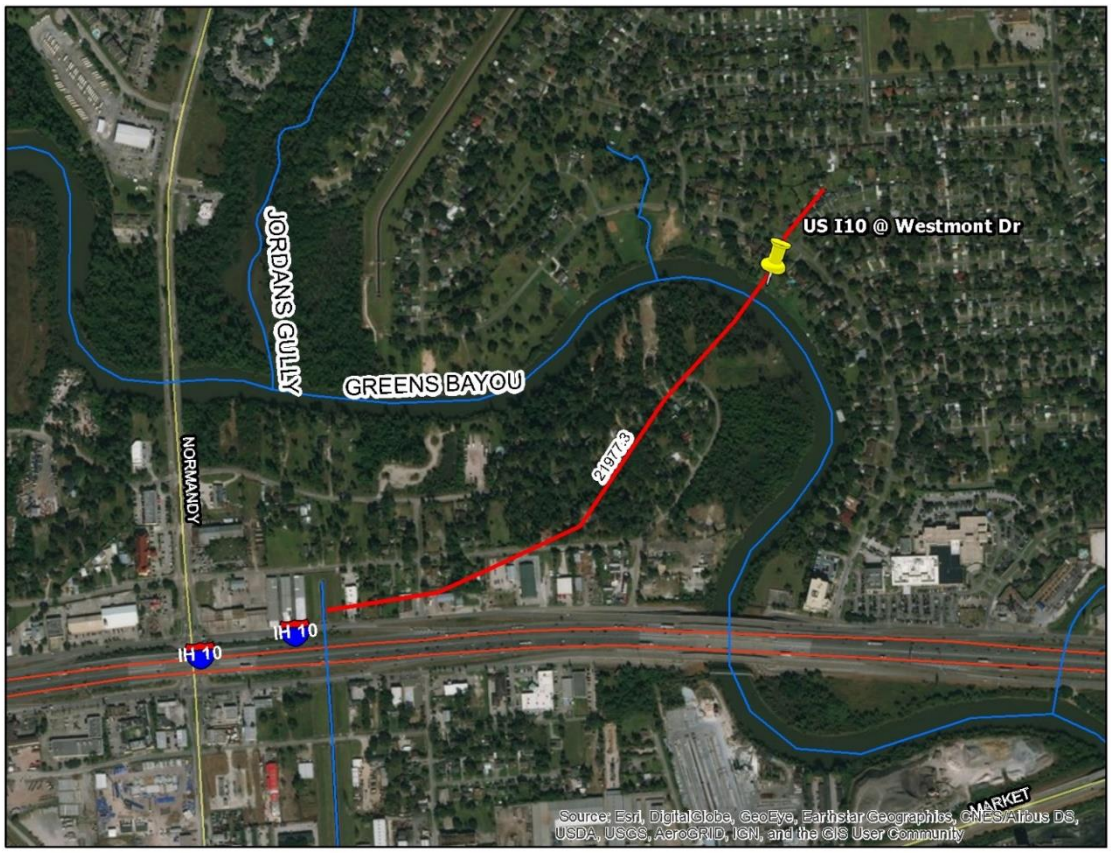
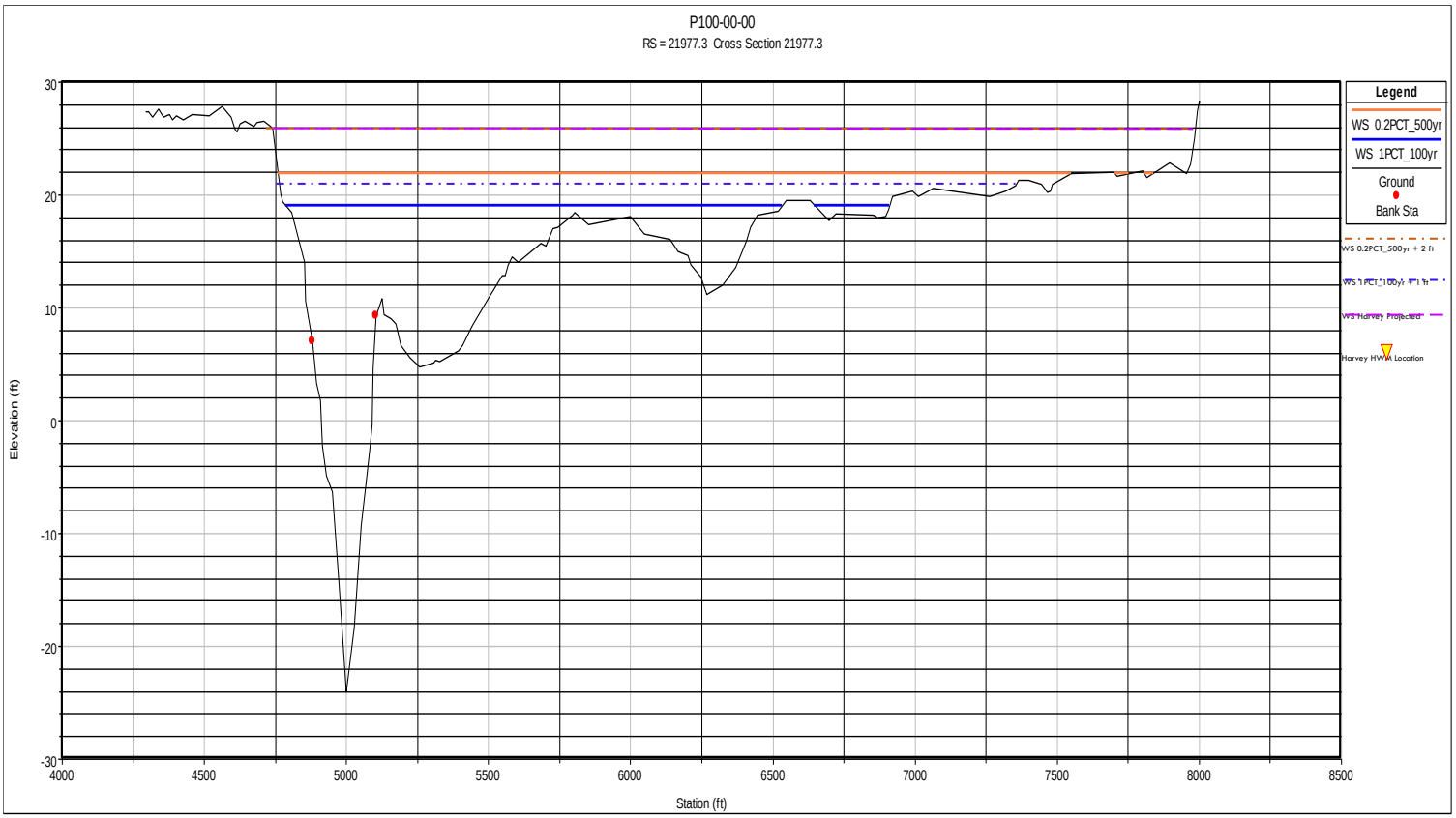
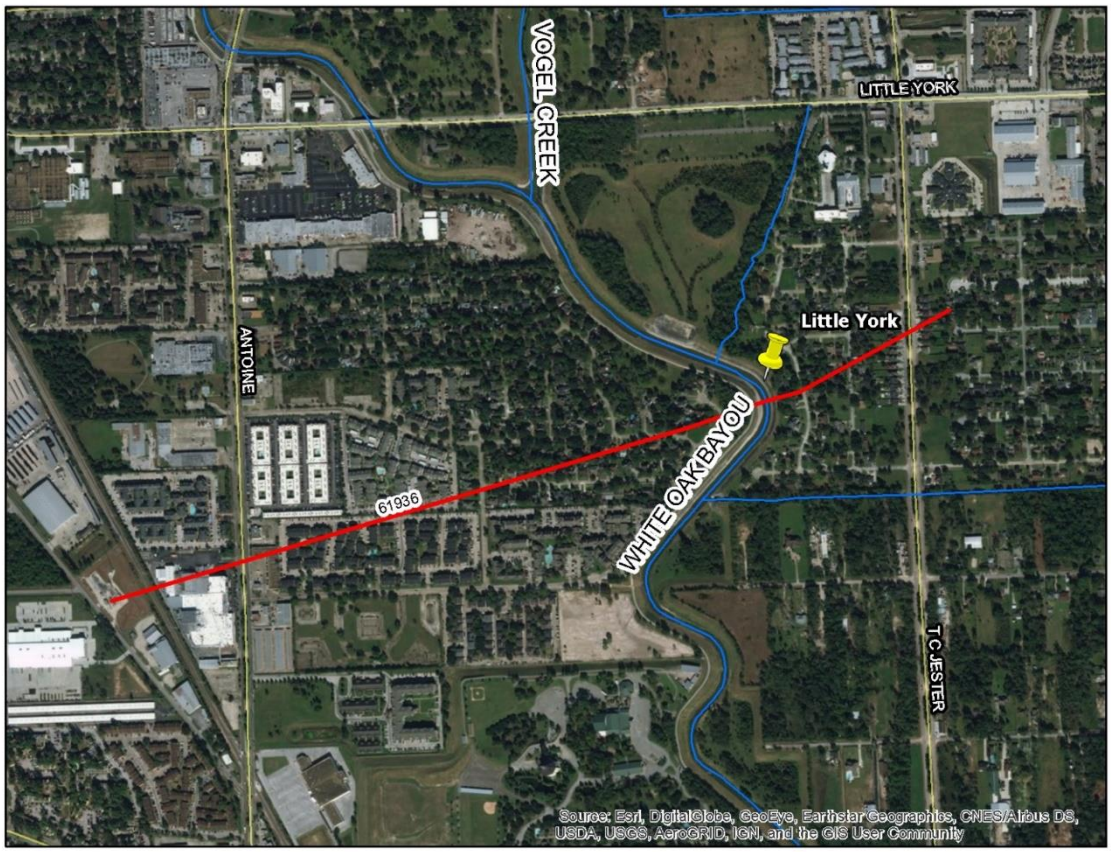
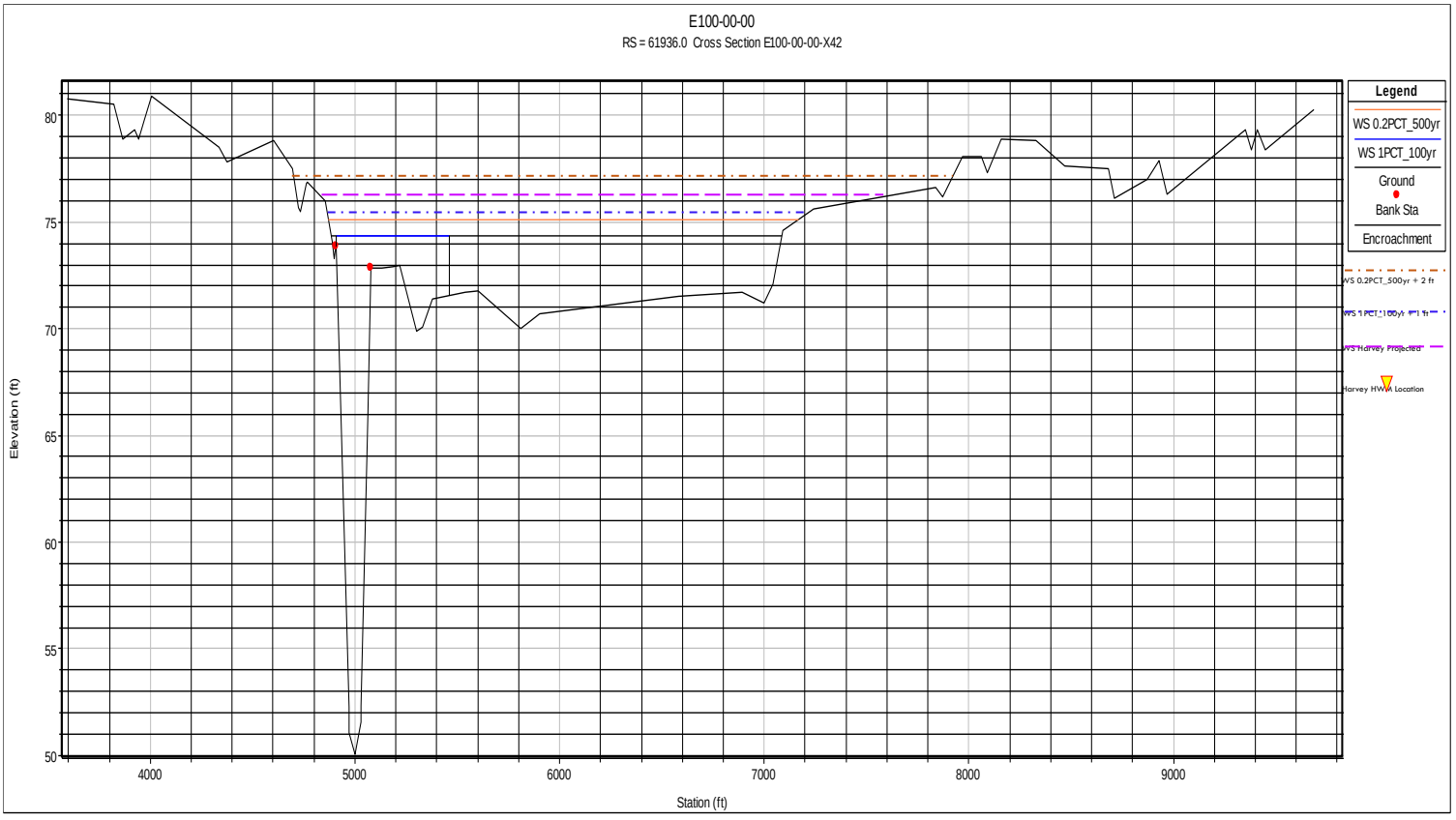




Appendix C - WHITE OAK WATERSHED =





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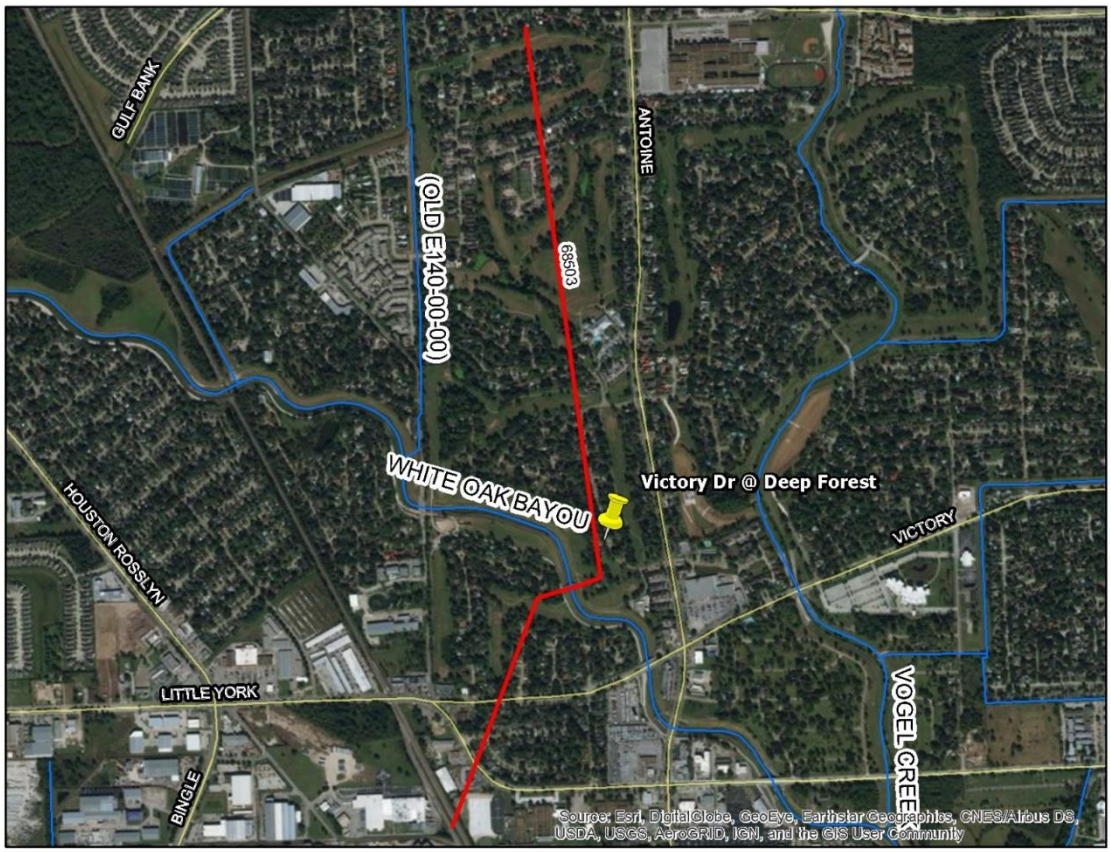
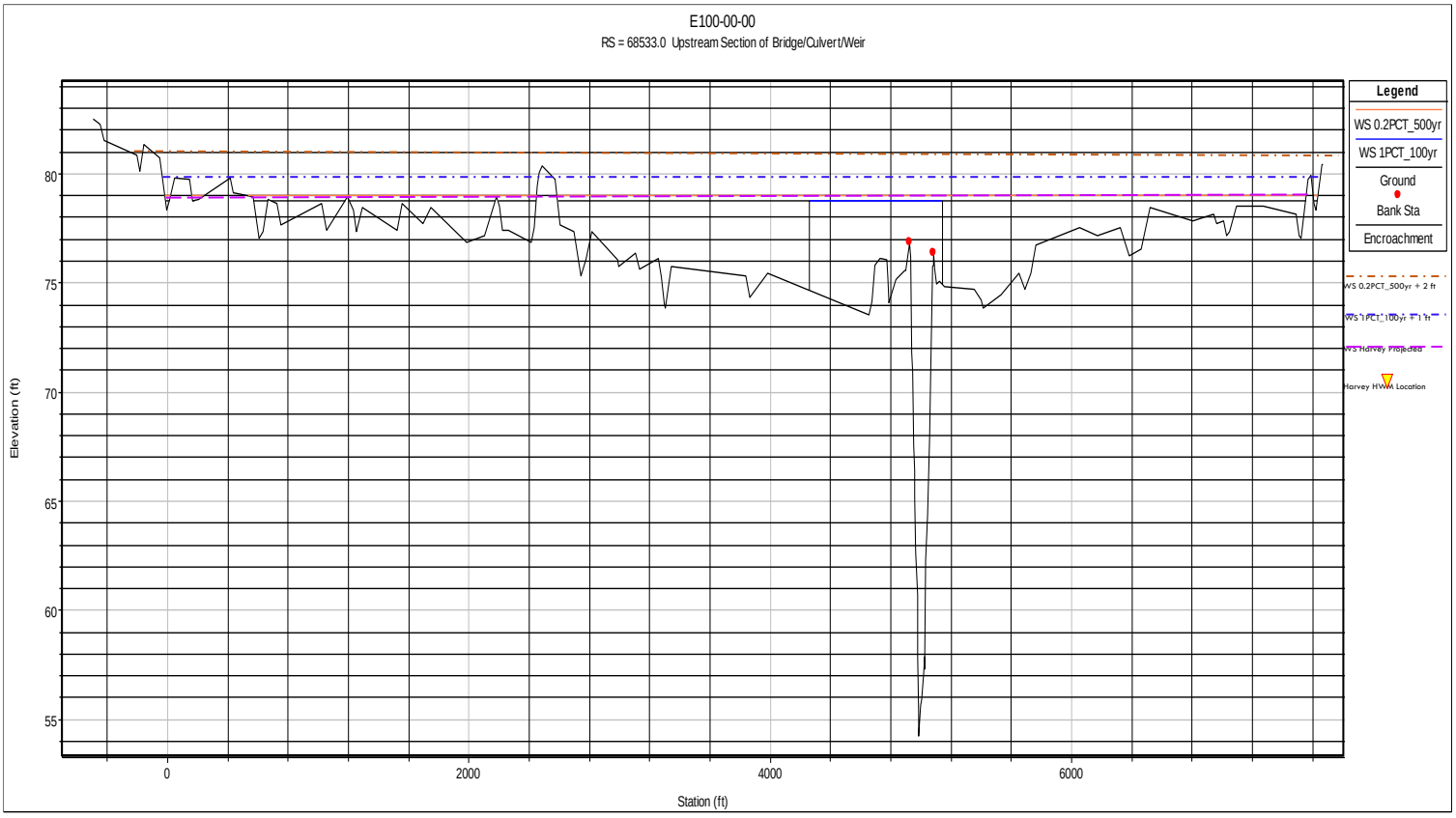
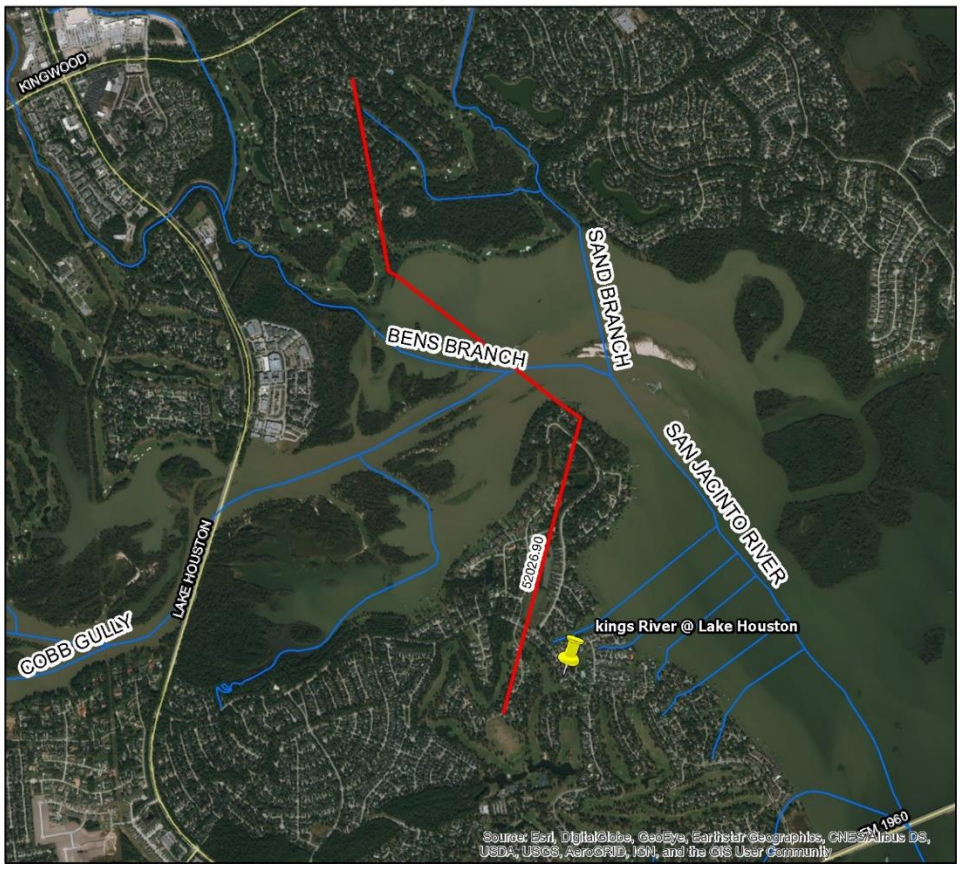
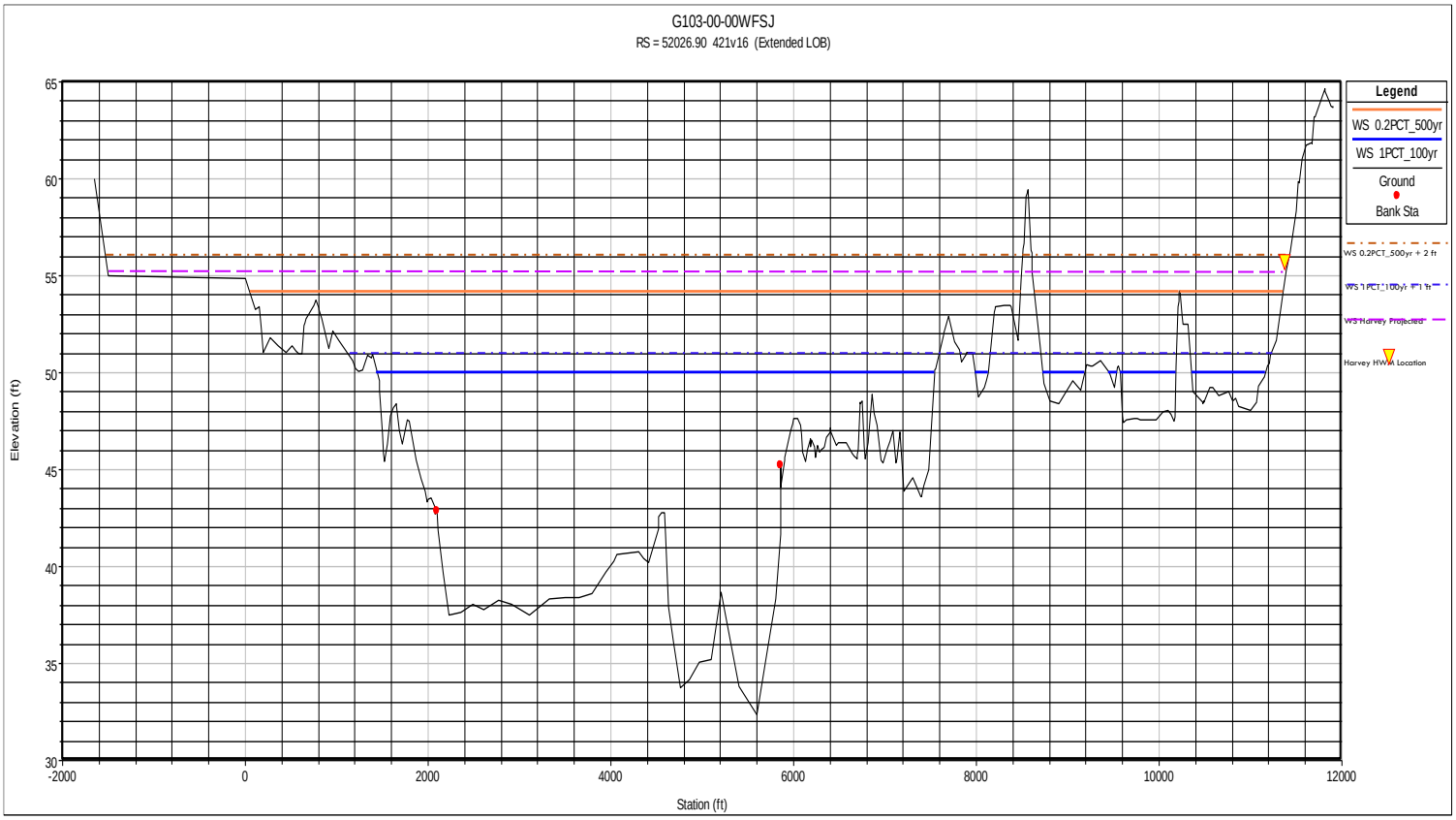




Appendix C - SAN JACINTO WATERSHED





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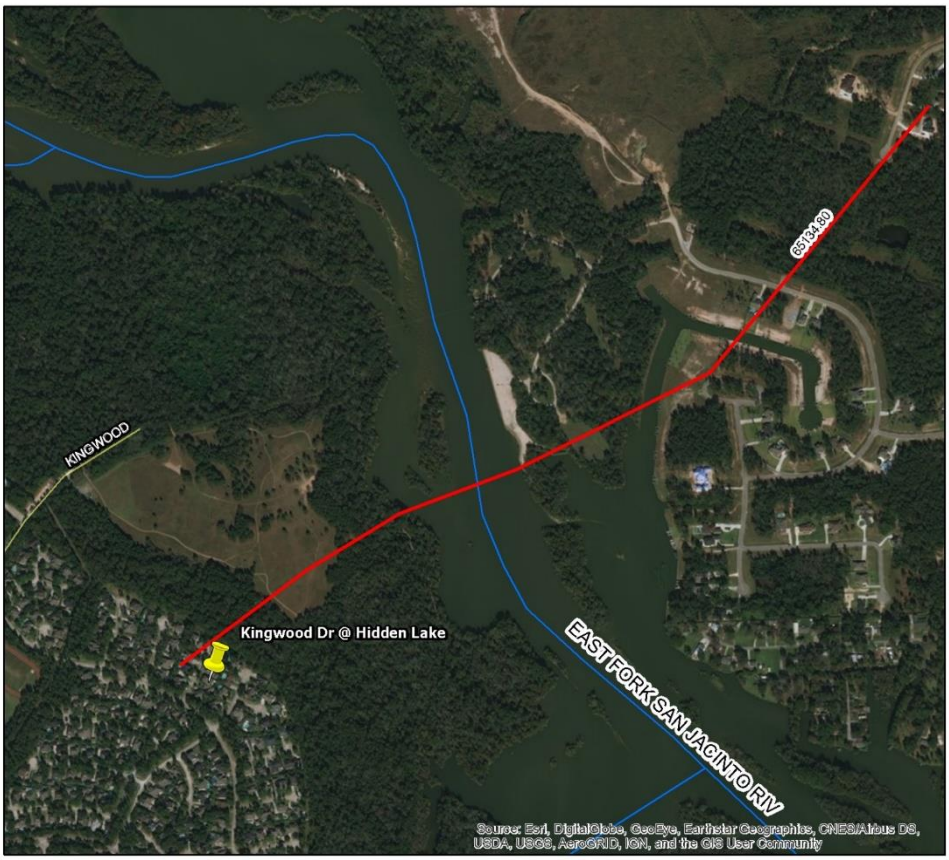

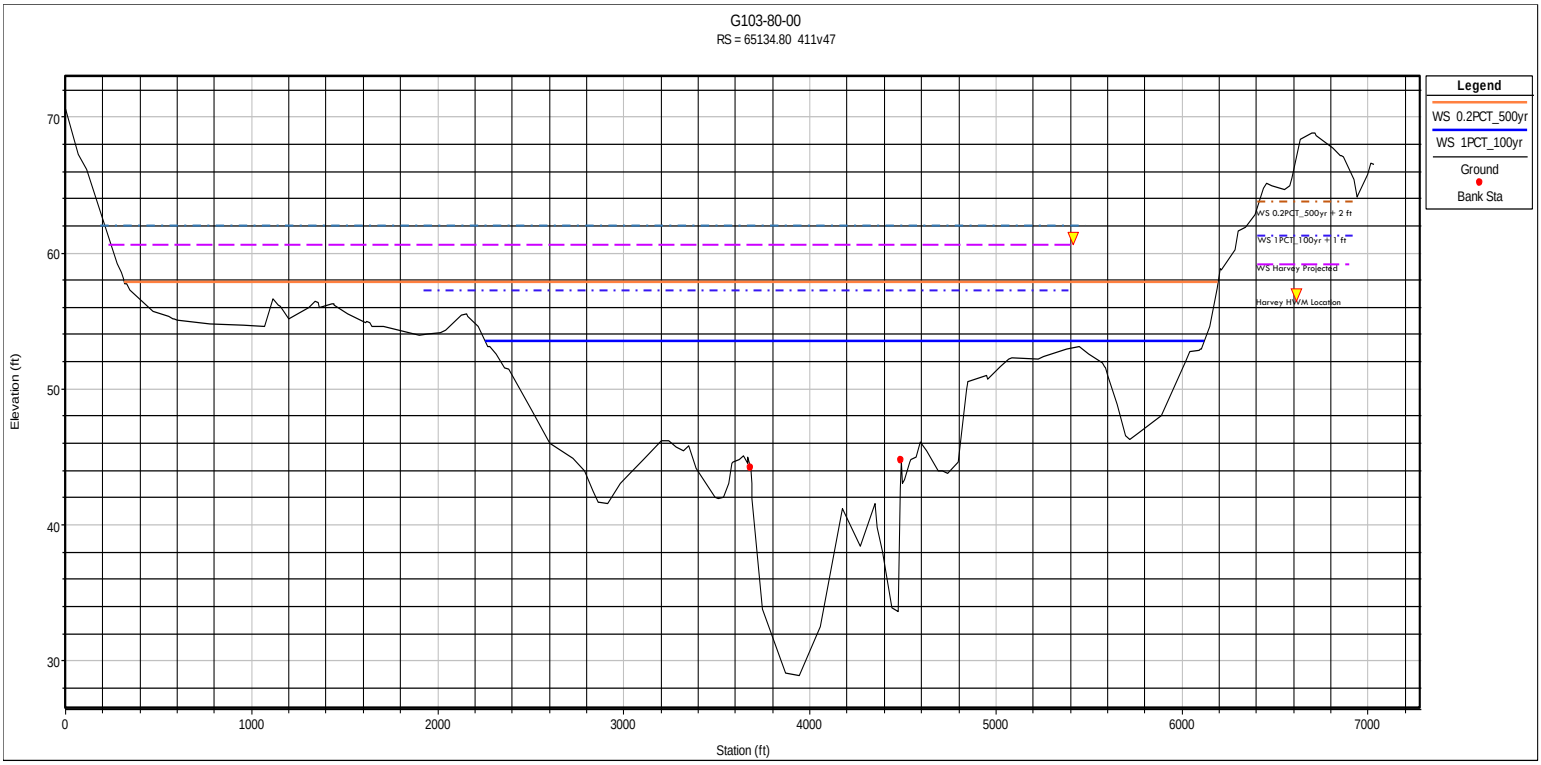

Appendix D – GHBA Cost Comparison

REPLACING SLAB WITH CRAWLSPACE CONSTRUCTION

THIS APPLIES TO PROPERTY BELOW THE .2% LEVEL, BUT ABOVE THE 1% LEVEL. The following shows a cost comparison of a home built with a conventional slab against a home built on a crawlspace with using treated lumber to raise the home above the 500yr floodplain PLUS 24". This should show only the cost to achieve a finished floor height using both methods for the purposes of showing a cost difference. This presupposes a 1650 sf, one-story home with a 2 car garage and 150sf of outdoor space (porch/entry). Please note that in the case of a 2 story home with the same footprint (1st floor 1650, 2 car, etc.), the additional cost to raise the structure is the SAME or greater.

	Slab Construction	Crawlspace	
Foundation	$29,030.00	$33,251.00	standard post tension slab vs. 12' pier with 30" grade beam
Building Pad	$7,550.00	$1,452.00	Only need a pad under garage in pier/beam, and that pad is grade height
Treated Lumber For crawlspace pony wall (lowest reasonable quality construction which should be allowed)	$0.00	$5,150.00	This is the predominant way to raise the finished floor
Frame Labor	$0.00	$3,221.75	All additional framing for crawlspace
Untreated Frame Lumber for floor system	$0.00	$5,277.00	Ditto above (this is estimated lumber and subfloor required to frame a 12" floor system), could be trusses for additional cost
Insulation under floor	$0.00	$4,782.00	should be closed cell foam under floor (most expensive insulation), sprayed on the underside of first floor subfloor. Anything else could create environmental issues
Cladding over crawlspace/access stairs	$0.00	$10,160.00	could be brick/siding/stucco, but in any case not needed in slab construction
Vent Blocks and block stairs on pad	$0.00	$2,150.00	code required (could be lattace)
Drainage Under Foundation	$0.00	$1,850.00	required in case of flooding
Flashing/Waterproofing Porch at First Floor Level	$0.00	$1,350.00	Slab could have finished concrete, but crawlspace entries must be waterproofed like a balcony
subtotal	**$36,580.00**	**$68,643.75**	
Added cost of using crawlspace construction		**$32,063.75**	

Draw 3 Photos

Front of House

Electrical Top Out

Interior Doors

Interior Door Knobs

Project Title: IKE-Environmental Photos 1

APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery

Work Write-Up / Cost Estimate

Subrecipient Name:	City Of Houston HCDD	Contract Number:	13-182-000-7295/72120001
Homeowner Name:		Activity Number:	
Home Address:			F-1450 3/1 Standard Non-Coastal
Building Contractor Name and Address:			
State Contract Builder:	(●) Yes ( ) No		

SITE SPECIFIC - SITE PREP

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Dumpster	Trash container with approved removal / disposal as required throughout the construction process					
	Site Toilet	Provide temporary toilet facilities from job start until approval of permanent facilities					
	Fill	Strip areas within bldg. lines, proof roll exposed area, under cut and replace weak areas and provide an additional 12" Select Fill compacted in a max. 8" lifts with 95% compaction. Build up pad high enough to provide 6" drop in every 5' away from perimeter of structure or to municipality height requirements if greater. Fill all holes on site caused by any house, concrete, tree removal and provide positive drainage away from the foundation.				$ 7,040.00	
	Site Prep	Prepare the site for construction: Signage, silt fence as needed, permit boards, small trash and landscape debris removed.					
	Make Ready	Final Clean					
	Sod	Provide 4 Pallets					
	Termite treatment	Termite treatment... Subterrainian termite protection.					
	Other	Fill Dirt Delivered, Spread, and Compacted per Truck Load (12 Cubic Yards)	8		$ 140.00	$ 1,120.00	
	Other	Not used	0		$ -	$ -	
	Other	Not Used			$ -	$ -	-
	Site Specific/Site Prep						$ 8,160.00

SITE SPECIFIC - ELEVATION

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Elevation	Refer to Foundation line item				$ -	
	Site Specific/Elevation						$ -

APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery
Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
SITE SPECIFIC - DEMOLITION							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Demo	Demo Home	2392		$ 3.46	$ 8,276.32	
	Additional Demo	Demo Flatwork	1048		$ 1.50	$ 1,572.00	
	Site Specific/Demolition						$ 9,848.32
SITE SPECIFIC - ACCESSIBILITY							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Type (ramp, lift, etc.)					$ -	
	Site Specific/Accessibility						$ -
SITE SPECIFIC - ABATEMENT							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Lead Paint Abatement	Not Used				$ -	
	Asbestos	Not Used				$ -	
	Other	Tree Trimming	3		$ 350.00	$ 1,050.00	
	Other	Not Used	0		$ -	$ -	
	Site Specific/Abatement						$ 1,050.00
	Sub-Total - Site Specific						$ 19,058.32

Texas General Land Office - Disaster Recovery
Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
GENERAL CONSTRUCTION - HARD COSTS							
Foundation							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Slab/Foundation	Elevate Using Pilings from 3' to 7' above Grade with conventional flooring.				$ 28,752.00	
	Porch	Included with raised foundation.					
	Foundation Costs						$ 28,752.00
Flatwork							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Flat work	Concrete Drive and Sidewalk.				$ 6,853.00	
	Flatwork Costs						$ 6,853.00

APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery

Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
Plumbing							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Underground	New main sewer and water supply lines to tap/meter including excavation and backfill, per plans and specifications and applicable codes.					
	Rough-in	Drain, waste and vent stack plumbing lines using schedule 40 PVC or equal, per plans and specifications and applicable codes.					
	Top-Out	CPVC water supply lines, pressure test entire house. Install water heater, per plans and specifications and applicable codes.					
	Kitchen Sink	Install a 2 equal sized compartment, 29"x22" 10" deep minimum stainless steel, kitchen sink with a single lever, chrome kitchen faucet per plans and specifications.					
	Toilet	2 piece, close coupled, white vitreous china, water saving commode elongated by American Standard or equivalent 17" AFF. Includes supply pipe, shut-off valve, wax seal and toilet seat per plans and specifications.				$ 10,344.00	
	Toilet Seat	Included with toilet.					
	Tub w/ Surround	Fiberglass tub/shower combo with low maintenance enclosure. Provide shower head, curtain rod and plumbing access per plans and specifications.					
	Bathroom Faucet	Lever handles, washerless, chrome finish					
	Tub Faucet	Lever handles, washerless, chrome finish					
	Copper/PVC/Flex	Included above.					
	Hose Bib	Provide per plans and specifications					
	Other	Complete Plumbing for home					
	Water/Sewer Tap	Water Tap, Long (if needed) Contractor to provide receipt.				$ 1,650.00	
	Water/Sewer Tap	Not Used				$ -	
	Water/Sewer Line	Not Used			$ -	$ -	
	Water/Sewer Line	Not Used			$ -	$ -	
	Plumbing Costs						$ 11,994.00

APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery

Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
Electrical							
	Description	**Specification Detailed Description**	**Square Feet, Number of Items, or Linear Feet**	**Unit of Measure (UOM)**	**Cost per UOM per Item (including Labor)**	**Cost per Item**	**Total**
	Electric Rough-In	Provide permit, wiring to code with a minimum 200 Amp service per codes, plans and specifications. All circuits to be copper. Separate circuits for the refrigerator, dishwasher, range and microwave / vent hood will be provided. 48" to top breaker of panel box, electrical switch plates to be mounted 48" to top of outlet A.F.F., outlets to be mounted 15" A.F.F. to bottom of box. Electrical service wire to be copper. Install per plans and specifications and applicable codes. Includes wiring for smoke/CO2 detectors, cable, TV, telephone per plans and specifications					
	Electric Top-Out	Trim out electric and connect all appliances and panel. Panel box will be labeled for each breaker and have room for a minimum of two additional circuits. Install all fixtures with white switches, & outlets, per plans and specifications and applicable codes.					
	Range Vent	Installation of Vent Hood vented to the exterior, as indicated in plans and specifications.				$ 7,974.00	
	Interior Lights	Per plans and specifications					
	Bath Vent/Light	Per plans and specifications					
	Ceiling Fans	Energy Star Rated ceiling fan with light kit, brushed nickel finish, double switched. Fan to be 52" 5-blade fan. Provide per plans and specifications.					
	Exterior Lights	Per plans and specifications					
	Smoke/CO2, TV, Telephone	Per plans and specifications					
	Doorbell	Per plans and specifications					
	Other	Complete electrical for home					
	Other	Not Used			0	$ -	
	Electrical Costs						$ 7,974.00
Framing							
	Description	**Specification Detailed Description**	**Square Feet, Number of Items, or Linear Feet**	**Unit of Measure (UOM)**	**Cost per UOM per Item (including Labor)**	**Cost per Item**	**Total**
	Interior Framing	Includes all labor and materials necessary to complete the interior framing and interior shear walls per plans and specifications. #2 SYP is required.					
	Exterior Framing	Includes all labor and materials necessary to complete the exterior framing per plans and specifications. #2 SYP is required					
	Roof Framing	Includes all labor and materials necessary to complete the roof framing per plans and specifications. #2 SYP is required				$ 20,421.00	
	Hardware	Anchors/Clips/Braces/Straps/Fasteners per plans and specifications					
	Exterior Sheathing	Exterior walls sheathed in accordance with the Plans and Specifications					
	Porch Columns	Per plans and specifications					

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APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery

Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Framing Costs						$ 20,421.00
Doors & Windows							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Interior Doors	Provide Masonite (or equivalent) 1 3/8" 6 panel H/C hollow core doors. Per plans and specifications.					
	Interior Hardware	Provide per plans and specifications					
	Exterior Entrance Door	Provide raised 6 panel fiberglass or steel insulated rated door (w/transom if applicable) meeting the engineered design pressures, and plans and specifications.					
	Exterior Secondary Entrance Door	Provide raised 6 panel fiberglass or steel insulated rated door meeting the engineered design pressures, and plans and specifications.				$ 6,486.00	
	Exterior Hardware	Provide per plans and specifications					
	Windows and Screens	Energy Rated Dual-Pane, vinyl, Low E windows with lock and removable window screens. Per plans and specifications.					
	Storm Doors	Not used					
	Attic Access	Provide per plans and specifications					
	Doors and Windows Costs						$ 6,486.00
Insulation							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Walls	Provide and install R-15 unfaced fiberglass batts in 4" exterior walls, R-19 in 6" exterior walls per plans and specifications. (formaldehyde free) All voids around windows, exterior doors, and wall penetrations to be filled with foamed-in-place thermal insulation. (Refer to Exterior Surface - Noise Attenuation if noise mitigation is required for home.)				$ 2,561.00	
	Ceilings	Provide and install R-38 fiberglass (formaldehyde free) blown insulation in attic. Attic baffles between each rafter for cross ventilation.					
	Insulation Costs						$ 2,561.00

APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery

Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
Exterior Surface							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Siding, Soffits, and Trim	James Hardie or equal 8 1/4" panels with 7 1/2" exposure. All James Hardie material and accessories per plans and specifications.. All soffit will be continuous vented Hardiplank and bricks. Tyvek ThermaWrap barrier installed on all exterior walls.				$ 8,764.00	
	Column Wrap	Provide per plans and specifications.					
	Shutters	Provide per plans and specifications.					
	Gable vents	Provide per plans and specifications.					
	Noise Attenuation	Not Required				$ -	
	Gutters or Downspouts	Not Required			$ -	$ -	
	Exterior Surface Costs						$ 8,764.00
Interior Surface							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Drywall	Provide and install 1/2" drywall on ceilings, 1/2" drywall on walls, water resistant drywall in bathroom wet areas. (If home requires noise mitigation, refer to Exterior Surface - Noise Attenuation for description of drywall to be used.)				$ 5,335.00	
	Tape, Texture, and Trim	Finish drywall to a level 4 finish orange peel / knock down texture finish.					
	Interior Surface Costs						$ 5,335.00
Mechanical							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	HVAC	Energy Star Rated (per plan specifications) 18 + SEER Central Air and Heating system with insulated ducts and sealed return air. Appropriately sized for space and meeting all applicable codes, plans and specifications.. Duct Blaster test on HVAC				$ 9,763.00	
	Vent Hood	Vent Hood combo vent to exterior per plans and specifications.					
	Dryer Vent	Dryer vent exhaust to exterior per plans and specifications					
	Underground Gas Line	Not Used			$ -	$ -	
	Mechanical Costs						$ 9,763.00

APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery

Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
Exterior Surface							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Siding, Soffits, and Trim	James Hardie or equal 8 1/4" panels with 7 1/2" exposure. All James Hardie material and accessories per plans and specifications... All soffit will be continuous vented Hardiplank and bricks. Tyvek ThermaWrap barrier installed on all exterior walls.				$ 8,764.00	
	Column Wrap	Provide per plans and specifications.					
	Shutters	Provide per plans and specifications.					
	Gable vents	Provide per plans and specifications.					
	Noise Attenuation	Not Required				$ -	
	Gutters or Downspouts	Not Required			$ -	$ -	
	Exterior Surface Costs						$ 8,764.00
Interior Surface							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Drywall	Provide and install 1/2" drywall on ceilings, 1/2" drywall on walls, water resistant drywall in bathroom wet areas. (If home requires noise mitigation, refer to Exterior Surface - Noise Attenuation for description of drywall to be used.)				$ 5,335.00	
	Tape, Texture, and Trim	Finish drywall to a level 4 finish orange peel / knock down texture finish.					
	Interior Surface Costs						$ 5,335.00
Mechanical							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	HVAC	Energy Star Rated (per plan specifications) 18 + SEER Central Air and Heating system with insulated ducts and sealed return air. Appropriately sized for space and meeting all applicable codes, plans and specifications... Duct Blaster test on HVAC				$ 9,763.00	
	Vent Hood	Vent Hood combo vent to exterior per plans and specifications.					
	Dryer Vent	Dryer vent exhaust to exterior per plans and specifications					
	Underground Gas Line	Not Used			$ -	$ -	
	Mechanical Costs						$ 9,763.00

APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery

Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
Finish Carpentry							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Trim Carpentry	Provide and install all finish carpentry to include baseboard, casings, moldings, closet shelving, closet rods, interior doors, exterior doors, and necessary hardware per plan and specifications.				$ 2,540.00	
	Finish Carpentry Costs						$ 2,540.00
Cabinets							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Base Cabinets	Install kitchen base cabinets (all plywood boxes with solid wood frames and doors), including utility room (if required) per plans and specifications.					
	Wall Cabinets	Install 36" kitchen wall cabinets (all plywood boxes with solid wood frames and doors), including utility room (if required) per plans and specifications.				$ 8,637.00	
	Counter Top	Install laminate counter-tops in kitchen per plans and specs.					
	Bath Vanity	Install bathroom vanity cabinets (all plywood boxes with solid wood frames and doors). Install 1/2" thick solid polymer vanity tops with integral sink per plans and specifications.					
	Cabinet Costs						$ 8,637.00
Appliances							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Range	Provide and install in accordance with plans and specifications.					
	Refrigerator	Provide and install in accordance with plans and specifications.					
	Dishwasher	Provide and install in accordance with plans and specifications.				$ 1,793.00	
	Vent Hood	Provide in accordance with plans and specifications. Material only. Installation price is in electrical section.					
	Appliances Costs						$ 1,793.00
Flooring							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Carpet	28oz carpet, installed on a 6 pound pad, per plans and specifications.					
	Vinyl	Armstrong "LuxePlank" or Mannington "Nature's Path or equal; 1/8" thick x 36" length plank tile and transition strips per plans and specifications or 12"X 12" VCT.				$ 4,986.00	
	Flooring Costs						$ 4,986.00

APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery

Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
Paint							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Interior Paint	3 tone interior paint scheme, Ceiling/Wall/Trim. Minimum 20 year sealant.				$ 4,672.00	
	Exterior Paint	Up to 3 tone exterior paint scheme, exterior field, exterior trim, doors and railings. Minimum 20 year sealant.					
	Paint Costs						$ 4,672.00
Roofing							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Shingles	25 years architectural fiberglass (1st run) based shingle, UL class A rated. This includes 28 gauge galvanized roof edge flashing, 26 gauge galvanized steel roof valley and tie-in flashing, "Shingle Over Type" ridge vent, minimum 15 lb. felt, & eve drip. Meterials must be TDI approved. Provide per plans and specifications.				$ 5,759.00	
	Decking	15/32 APA Exposure 1 Plywood with radiant barrier (if home requires noise mitigation do not use radiant barrier decking. Refer to Exterior Surface - Noise Attenuation).					
	Roofing Costs						$ 5,759.00
Finish Details							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Med Cab/Mirror	(1) plate mirror installed per bathroom. Dimensions per plan.				$ 636.00	
	Hardware	Provide per plans and specifications.					
	ADA Bathroom - Master	Not Used				$ -	
	ADA Bathroom - Master	Not Used				$ -	
	ADA Bathroom - Guest	Not Used				$ -	
	ADA Bathroom - Guest	Not Used				$ -	
	Hearing/Visual Impairment	Not Required				$ -	
	ADA Ramp	Not Required				$ -	
	Finish Details Costs						$ 636.00
	Sub-Total - General Construction - Hard Costs						$ 137,928.00

APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery
Work Write-Up / Cost Estimate

	Description	Specification Detailed Description		Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
MISCELLANEOUS SOFT COSTS - BUILDER								
	Description	Specification Detailed Description		Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Permits	City/County/Municipality and Engineering Letter (receipt to be submitted)					$ 3,000.00	
	Bonds	Builders Risk/ Performance, Payment and Maintenance bonds (receipt to be submitted on 66% draw).					$ 4,000.00	
	Utilities	Connection fees. Indicate if included elsewhere.					$ -	
	Floodplain Permit	Not Required					$ -	
	Insurance	Homeowners insurance policy to include 60% content coverage, wind storm & flood insurance if in floodplain. (receipt to be submitted on final draw)					$ 3,000.00	
	Soil compaction testing	Not Used					$ -	
	Boundary Survey		Boundary Survey				$ 2,367.51	
	Elevation Certificates		Intermediate Elevation Certificates				$ 498.73	
	Elevation Certificates		Finished construction Elevation Certificates				$ 498.73	
	Form Survey		Form Survey				$ 350.00	
	Geotechnical Work		Deep Boring Investigation				$ 1,050.00	
	Site Specific Plans		Site Specific Plans				$ 2,600.00	
	Reconnect	Electrical & Gas Reconnect					$ 203.00	
	Sub-Total - Misc. Soft Costs - Builder							$ 17,567.97
MISCELLANEOUS SOFT COSTS - SUBRECIPIENT								
	Description	Specification Detailed Description		Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Permits						$ -	
	Bonds						$ -	
	Insurance						$ -	
	Other						$ -	

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APPENDIX E – HCDD COST COMPARISON – PIER AND BEAM

Texas General Land Office - Disaster Recovery
Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Sub-Total - Misc. Soft Costs - Subrecipient						$ -
MISCELLANEOUS SOFT COSTS - STATE VENDOR -							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Boundary Survey						
	Form Survey						
	Geotechnical Work						
	Site Specific Plans						
	Elevation Certificates						
	Elevation Certificates						
	Permits						
	Sub-Total - Misc. Soft Costs - State Vendor						$ -

Texas General Land Office - Disaster Recovery
Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
INSPECTIONS - STATE VENDOR							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Inspections					$ -	
	Other					$ -	
	Sub-Total - Inspections - State Vendor						$ -
HOP Associated Costs (Round 2 Only) (i.e. lot acquisition, home purchase price, other)							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Lot Acquisition					$ -	
	Home Purchase					$ -	
	Other					$ -	
	Sub-Total - HOP Services						$ -
	DOB Scope Reduction - See Attached DOB Exception Acknowledgement Form and Scope Reduction Worksheet						
	Budgeted Project Costs						$ 174,554.29
	Gap Funding						
	Reserve Funding						$ -
	Total Budgeted Project Costs						$ 174,554.29

Homeowner Signature:

Builder Signature:

WARNING: If it is determined through monitoring that the onsite support documentation of actual costs does not agree with the itemized invoice(s) submitted, the Subrecipient will be subject to repayment of CDBG funds. Subrecipients may not request funds in excess of the actual amount expended for rehabilitation or reconstruction of the eligible home.

100 percent Photos

CITY OF HOUSTON HOUSING AND COMMUNITY DEVELOPMENT

9/30/2015 Project: 1

APPENDIX E – HCDD COST COMPARISON – SLAB ON GRADE

Texas General Land Office - Disaster Recovery

Work Write-Up / Cost Estimate

Subrecipient Name:		Contract Number:	13-182-000-7295/72120001
Homeowner Name:		Activity Number:	
Home Address:			G-1382 3/2 Standard Non-Coastal
Building Contractor Name and Address:			
State Contract Builder:	◉ Yes ○ No		

SITE SPECIFIC - SITE PREP

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Dumpster	Trash container with approved removal / disposal as required throughout the construction process					
	Site Toilet	Provide temporary toilet facilities from job start until approval of permanent facilities					
	Fill	Strip areas within bldg. lines, proof roll exposed area, under cut and replace weak areas and provide an additional 12" Select Fill compacted in a max. 8" lifts with 95% compaction. Build up pad high enough to provide 6" drop in every 5' away from perimeter of structure or to municipality height requirements if greater. Fill all holes on site caused by any house, concrete, tree removal and provide positive drainage away from the foundation.				$ 6,934.00	
	Site Prep	Prepare the site for construction: Signage, silt fence as needed, permit boards, small trash and landscape debris removed.					
	Make Ready	Final Clean					
	Sod	Provide 4 Pallets					
	Termite treatment	Termite treatment... Subterrainian termite protection					
	Other	Curb Cut	1	curb cut	$ 400.00	$ 400.00	
	Other	Not Used			$ -	$ -	
	Other	Not Used			$ -	$ -	
	Site Specific/Site Prep						$ 7,334.00

SITE SPECIFIC - ELEVATION

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Elevation	Refer to Foundation line item				$ -	
	Site Specific/Elevation						$ -

APPENDIX E – HCDD COST COMPARISON – SLAB ON GRADE

Texas General Land Office - Disaster Recovery
Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
SITE SPECIFIC - DEMOLITION							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Demolition	Demolition of Home @ 2000 SF or less				$ 6,955.00	
	Additional Demo	Not Used				$ -	
	Additional Demo	Not Used			$ -	$ -	
	Site Specific/Demolition						$ 6,955.00
SITE SPECIFIC - ACCESSIBILITY							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Type (ramp, lift, etc.)					$ -	
	Site Specific/Accessibility						$ -
SITE SPECIFIC - ABATEMENT							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Lead Paint Abatement	Not Used				$ -	
	Asbestos	Not Used				$ -	
	Other	Not Used			$ -	$ -	
	Other	Not Used			$ -	$ -	
	Site Specific/Abatement						$ -
	Sub-Total - Site Specific						$ 14,289.00

Texas General Land Office - Disaster Recovery
Work Write-Up / Cost Estimate

	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
GENERAL CONSTRUCTION - HARD COSTS							
Foundation							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Slab	Post tension slab on grade less than 13" above grade, 3000 PSI concrete, monolithic slab per plans and specification, including vapor barrier.				$ 17,762.00	
	Porch	Included with slab.					
	Foundation Costs						$ 17,762.00
Flatwork							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Flat work	Concrete Drive and Sidewalk.				$ 3,103.00	
	Patio	4" thick 10'x10' 3000 PSI concrete patio per plans and specification, including vapor barrier.					
	Other	Not Used			$ -	$ -	
	Flatwork Costs						$ 3,103.00

APPENDIX E – HCDD COST COMPARISON – SLAB ON GRADE

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	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
Plumbing							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Underground	New main sewer and water supply lines to tap/meter including excavation and backfill, per plans and specifications and applicable codes.					
	Rough-In	Drain, waste and vent stack plumbing lines using schedule 40 PVC or equal, per plans and specifications and applicable codes.					
	Top-Out	CPVC water supply lines, pressure test entire house. Install water heater, per plans and specifications and applicable codes.					
	Kitchen Sink	Install a 2 equal sized compartment, 29"x22" 10" deep minimum stainless steel, kitchen sink with a single lever, chrome kitchen faucet per plans and specifications.					
	Toilet	2 piece, close coupled, white vitreous china, water saving commode elongated by American Standard or equivalent 17" AFF. Includes supply pipe, shut-off valve, wax seal and toilet seat per plans and specifications.				$ 10,098.00	
	Toilet Seat	Included with toilet.					
	Tub w/ Surround	Fiberglass tub/shower combo with low maintenance enclosure. Provide shower head, curtain rod and plumbing access per plans and specifications.					
	Bathroom Faucet	Lever handles, washerless, chrome finish					
	Tub Faucet	Lever handles, washerless, chrome finish					
	Copper/PVC/Flex	Included above.					
	Hose Bib	Provide per plans and specifications					
	Other	Complete Plumbing for home					
	Water/Sewer Tap	Water Tap, Long (if needed) Contractor to provide receipt.				$ 1,650.00	
	Water/Sewer Tap	Not Used				$ -	
	Water/Sewer Line	Not Used			$ -	$ -	
	Water/Sewer Line	Not Used			$ -	$ -	
	Plumbing Costs						$ 11,748.00

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	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
Electrical							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Electric Rough-In	Provide permit, wiring to code with a minimum 200 Amp service per codes, plans and specifications. All circuits to be copper. Separate circuits for the refrigerator, dishwasher, range and microwave / vent hood will be provided. 48" to top breaker of panel box, electrical switch plates to be mounted 48" to top of outlet A.F.F., outlets to be mounted 15" A.F.F. to bottom of box. Electrical service wire to be copper. Install per plans and specifications and applicable codes. Includes wiring for smoke/CO2 detectors, cable, TV, telephone per plans and specifications					
	Electric Top-Out	Trim out electric and connect all appliances and panel. Panel box will be labeled for each breaker and have room for a minimum of two additional circuits. Install all fixtures with white switches, & outlets, per plans and specifications and applicable codes.					
	Range Vent	Installation of Microwave/Vent Hood combo vented to the exterior, as indicated in plans and specifications.				$ 7,474.00	
	Interior Lights	Per plans and specifications					
	Bath Vent/Light	Per plans and specifications					
	Ceiling Fans	Energy Star Rated ceiling fan with light kit, brushed nickel finish, double switched. Fan to be 52" 5-blade fan. Provide per plans and specifications.					
	Exterior Lights	Per plans and specifications					
	Smoke/CO2, TV, Telephone	Per plans and specifications					
	Doorbell	Per plans and specifications					
	Other	Complete electrical for home					
	Electrical Costs						$ 7,474.00
Framing							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Interior Framing	Includes all labor and materials necessary to complete the interior framing and interior shear walls per plans and specifications. #2 SYP is required.					
	Exterior Framing	Includes all labor and materials necessary to complete the exterior framing per plans and specifications. #2 SYP is required					
	Roof Framing	Includes all labor and materials necessary to complete the roof framing per plans and specifications. #2 SYP is required				$ 18,326.00	
	Hardware	Anchors/Clips/Braces/Straps/Fasteners per plans and specifications					
	Exterior Sheathing	Exterior walls sheathed in accordance with the Plans and Specifications					
	Porch Columns	Per plans and specifications					
	Framing Costs						$ 18,326.00
Doors & Windows							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Interior Doors	Provide Masonite (or equivalent) 1 3/8" 6 panel H/C hollow core doors. Per plans and specifications.					

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	Interior Hardware	Provide per plans and specifications					
	Exterior Entrance Door	Provide raised 6 panel fiberglass or steel insulated rated door (w/transom if applicable) meeting the engineered design pressures, and plans and specifications.					
	Exterior Secondary Entrance Door	Provide raised 6 panel fiberglass or steel insulated rated door meeting the engineered design pressures, and plans and specifications.				$ 6,069.00	
	Exterior Hardware	Provide per plans and specifications					
	Windows and Screens	Energy Rated Dual-Pane, vinyl, Low E windows with lock and removable window screens. Per plans and specifications.					
	Storm Doors	Not used					
	Attic Access	Provide per plans and specifications					
	Doors and Windows Costs						$ 6,069.00
Insulation							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Walls	Provide and install R-15 unfaced fiberglass batts in 4" exterior walls, R-19 in 6" exterior walls per plans and specifications. (formaldehyde free) All voids around windows, exterior doors, and wall penetrations to be filled with foamed-in-place thermal insulation. (Refer to Exterior Surface - Noise Attenuation if noise mitigation is required for home.)				$ 2,433.00	
	Ceilings	Provide and install R-38 fiberglass (formaldehyde free) blown insulation in attic. Attic baffles between each rafter for cross ventilation.					
	Insulation Costs						$ 2,433.00

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	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
Exterior Surface							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Siding, Soffits, and Trim	James Hardie or equal 8 1/4" panels with 7 1/2" exposure. All James Hardie material and accessories per plans and specifications.. All soffit will be continuous vented Hardiplank and bricks. Tyvek ThermaWrap barrier installed on all exterior walls.				$ 8,198.00	
	Column Wrap	Provide per plans and specifications.					
	Shutters	Provide per plans and specifications.					
	Gable vents	Provide per plans and specifications.					
	Noise Attenuation	Sound attenuation - walls and ceiling with open cell spray foam insulation & 5/8" drywall. (Insulation shall meet or exceed R-values. Additional drywall cost included in this line item. Radiant barrier roof decking should NOT be used if using spray foam insulation.)				$ 1,800.00	
	Gutters or Downspouts	Not Required			$ -	$ -	
	Exterior Surface Costs						$ 9,998.00
Interior Surface							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	Drywall	Provide and install 1/2" drywall on ceilings, 1/2" drywall on walls, water resistant drywall in bathroom wet areas. (If home requires noise mitigation, refer to Exterior Surface - Noise Attenuation for description of drywall to be used.)				$ 4,706.00	
	Tape, Texture, and Trim	Finish drywall to a level 4 finish orange peel / knock down texture finish.					
	Interior Surface Costs						$ 4,706.00
Mechanical							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (including Labor)	Cost per Item	Total
	HVAC	Energy Star Rated (per plan specifications) 18 + SEER Central Air and Heating system with insulated ducts and sealed return air. Appropriately sized for space and meeting all applicable codes, plans and specifications.. Duct Blaster test on HVAC				$ 9,578.00	
	Vent Hood	Vent Hood combo vent to exterior per plans and specifications.					
	Dryer Vent	Dryer vent exhaust to exterior per plans and specifications					
	Mechanical Costs						$ 9,578.00

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	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
Finish Carpentry							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Trim Carpentry	Provide and install all finish carpentry to include baseboard, casings, moldings, closet shelving, closet rods, interior doors, exterior doors, and necessary hardware per plan and specifications.				$ 2,579.00	
	Finish Carpentry Costs						$ 2,579.00
Cabinets							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Base Cabinets	Install kitchen base cabinets (all plywood boxes with solid wood frames and doors), including utility room (if required) per plans and specifications.					
	Wall Cabinets	Install 36" kitchen wall cabinets (all plywood boxes with solid wood frames and doors), including utility room (if required) per plans and specifications.				$ 8,775.00	
	Counter Top	Install laminate counter-tops in kitchen per plans and specs.					
	Bath Vanity	Install bathroom vanity cabinets (all plywood boxes with solid wood frames and doors). Install 1/2" thick solid polymer vanity tops with integral sink per plans and specifications.					
	Cabinet Costs						$ 8,775.00
Appliances							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Range	Provide and install in accordance with plans and specifications.					
	Refrigerator	Provide and install in accordance with plans and specifications.					
	Dishwasher	Provide and install in accordance with plans and specifications.				$ 1,793.00	
	Vent Hood	Provide in accordance with plans and specifications. Material only; installation price is in electrical section.					
	Appliances Costs						$ 1,793.00
Flooring							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Carpet	28oz carpet, installed on a 6 pound pad, per plans and specifications.					
	Vinyl	Armstrong "LuxePlank" or Mannington "Nature's Path or equal; 1/8" thick x 36" length plank tile and transition strips per plans and specifications or 12"X 12" VCT.				$ 4,610.00	
	Flooring Costs						$ 4,610.00

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	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
Paint							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Interior Paint	3 tone interior paint scheme, Ceiling/Wall/Trim. Minimum 20 year sealant.				$ 4,392.00	
	Exterior Paint	Up to 3 tone exterior paint scheme, exterior field, exterior trim, doors and railings. Minimum 20 year sealant.					
	Paint Costs						$ 4,392.00
Roofing							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Shingles	25 years architectural fiberglass (1st run) based shingle, UL class A rated. This includes 28 gauge galvanized roof edge flashing, 26 gauge galvanized steel roof valley and tie-in flashing, "Shingle Over Type" ridge vent. minimum 15 lb. felt, & eve drip. Materials must be TDI approved. Provide per plans and specifications.				$ 5,493.00	
	Decking	15/32 APA Exposure 1 Plywood with radiant barrier (If home requires noise mitigation do not use radiant barrier decking. Refer to Exterior Surface - Noise Attenuation).					
	Roofing Costs						$ 5,493.00
Finish Details							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Med Cab/Mirror	(1) plate mirror installed per bathroom. Dimensions per plan.				$ 610.00	
	Hardware	Provide per plans and specifications.					
	ADA Bathroom - Master	HC-2 Tub/Shower with Grab Bars, Fold-up Seat, and Shower Wand				$ 700.00	
	ADA Bathroom - Master	Grab Bars for Toilet, per plan design				$ 130.00	
	ADA Bathroom - Guest	Not Used				$ -	
	ADA Bathroom - Guest	Not Used				$ -	
	Hearing/Visual Impairment	Not Required				$ -	
	ADA Ramp	Not Required				$ -	
	Finish Details Costs						$ 1,440.00
	Sub-Total - General Construction - Hard Costs						$ 120,299.00

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	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
MISCELLANEOUS SOFT COSTS - BUILDER							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Permits	City/County/Municipality (receipt to be submitted)				$ 2,000.00	
	Bonds	Builders Risk/ Performance, Payment and Maintenance bonds (receipt to be submitted on 66% draw).				$ 5,000.00	
	Utilities	Connection fees. Indicate if included elsewhere.				$ -	
	Floodplain Permit	Not Required				$ -	
	Insurance	Homeowners insurance policy to include 60% content coverage, wind storm & flood insurance if in floodplain. (receipt to be submitted on final draw)				$ 3,000.00	
	Sub-Total - Misc. Soft Costs - Builder						$ 10,000.00
MISCELLANEOUS SOFT COSTS - SUBRECIPIENT							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Permits					$ -	
	Bonds					$ -	
	Insurance					$ -	
	Other					$ -	
	Sub-Total - Misc. Soft Costs - Subrecipient						$ -
MISCELLANEOUS SOFT COSTS - STATE VENDOR - HORNE							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Boundary Survey	Boundary Survey, Limited Topographic Survey				$ 1,876.14	
	Form Survey	Form Survey				$ 446.70	
	Geotechnical Work	Shallow Boring Investigation				$ 1,827.52	
	Site Specific Plans	Site Specific Plans				$ 1,686.96	
	Elevation Certificates	Not Required				$ -	
	Elevation Certificates	Not Required				$ -	
	Other					$ -	
	Sub-Total - Misc. Soft Costs - State Vendor Horne						$ 5,837.32

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	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
INSPECTIONS - STATE VENDOR							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Inspections					$ -	
	Other					$ -	
	Sub-Total - Inspections - State Vendor						$ -
HOP Associated Costs (Round 2 Only) (i.e. lot acquisition, home purchase price, other)							
	Description	Specification Detailed Description	Square Feet, Number of Items, or Linear Feet	Unit of Measure (UOM)	Cost per UOM per Item (Including Labor)	Cost per Item	Total
	Lot Acquisition					$ -	
	Home Purchase					$ -	
	Other					$ -	
	Sub-Total - HOP Services						$ -
	DOB Scope Reduction - See Attached DOB Exception Acknowledgement Form and Scope Reduction Worksheet						
	Budgeted Project Costs						$ 150,425.32
	Gap Funding						
	Reserve Funding						$ 13,459.00
	Total Budgeted Project Costs						$ 163,884.32

Homeowner Signature:

Builder Signature:

WARNING: If it is determined through monitoring that the on-site support documentation of actual costs does not agree with the itemized invoice(s) submitted, the Subrecipient will be subject to repayment of CDBG funds. Subrecipients may not request funds in excess of the actual amount expended for rehabilitation or reconstruction of the eligible home.